Using LID to Reduce Urban Runoff and Restore an Urbanized Watershed

Wisely **M**anaging **O**ur **U**rban **W**ater **R**esources

Neal Shapiro, City of Santa Monica

Putting LID in Stormwater Management,

College Park, MD

September 21-23, 2004

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Water Resources Management

QUESTIONS,

that need Answers

What water quality issues the City of Santa Monica addresses?

How does the City's urban runoff management program (URMP) manage, that is, reduce, Non-Point Source pollution in a sustainable manner?

What has worked and not worked? Why?

OBJECTIVES,

the Answers

Harvest urban runoff (dry/wet weather) for groundwater recharge and pollution treatment

Treat all dry weather and some wet weather urban runoff leaving the City

Connect land use/design to the Hydrologic Cycle, reducing the disconnect and disruption of water flow

Mimic nature; blend into the land

Take proactive, watershed approach to reducing urban runoff problems

Convert a perceived “waste” into a valuable resource for reuse - SMURRF

Urban Runoff – What is it?

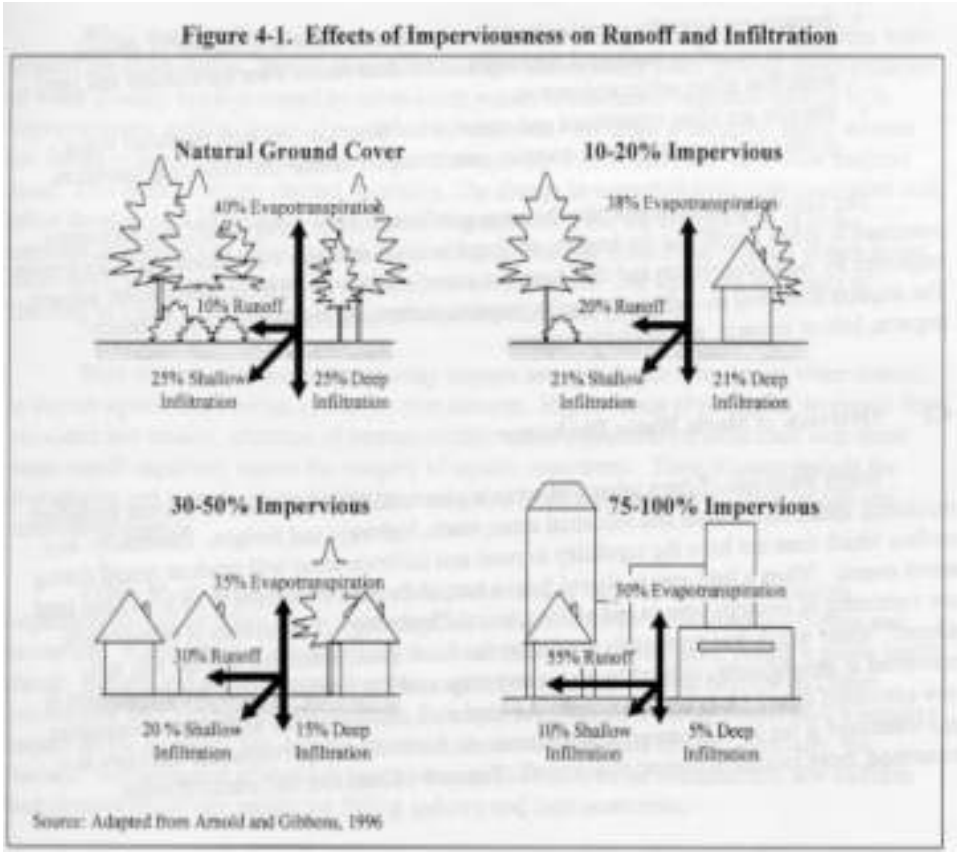
The Problem – Water Quality v. Quantity

- The Southern California Coastal Water Research Project, a leading marine research group in Southern CA, reported that storm water and urban runoff are the leading source of water pollution in the Los Angeles area; storm water pollution has increased 200-700 percent during the last 20 years.

- Stormwater has become a lethal cocktail of pollutants that now constitutes the single greatest source of water pollutants, contributing 50-60 percent of the pollutant load.
- Types and Sources of Pollutants
- According to the US EPA, urban stormwater is the largest source of water quality damage in estuaries, the second largest for wetlands degradation, third largest impairment of lakes and fourth largest source of river damage.

The Watershed Level –

Disrupting the Water Cycle



- **How water flows through our environment**

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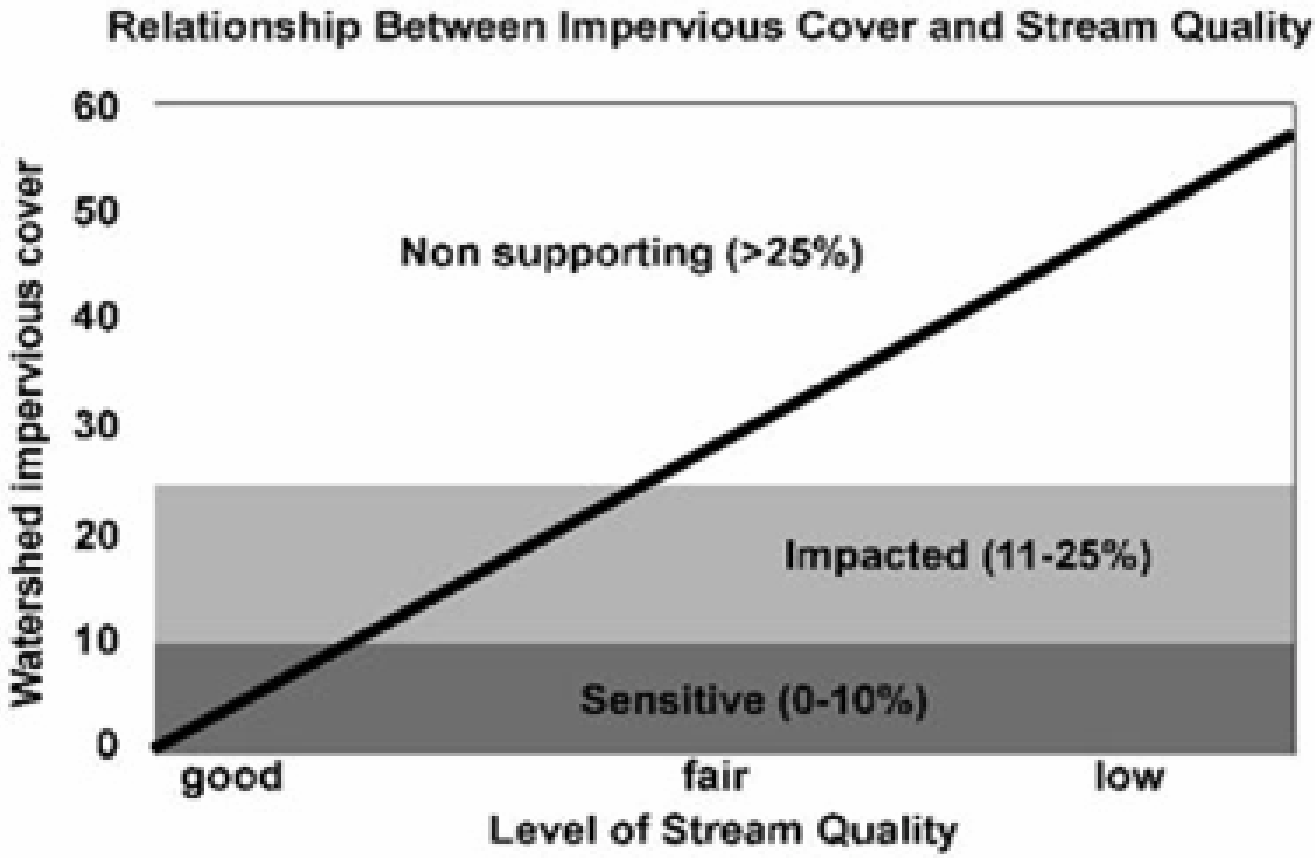
As hardscape increase, wat quality goes down.



Source: Schueler, T. 1994. The Importance of Imperviousness. In: Watershed Protection Techniques 1(3):100-111.

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Paving Our Way to Water Shortages:

How Sprawl Aggravates Drought

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Turning Impermeable to Permeable

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Santa Monica: Tourist Destination

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City Attractions

An Environmentally Concerned Community

- History of Political Activism

- Concern Over the Environment

THE Daily Breeze
A COPLEY LOS ANGELES NEWSPAPER
May 26, 1991 $1.00
Torrance, California
97th year/Number 146
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OUTLOOK EDITION

Study links drains, bay to sickness

Polluted runoff after storms can hike risk of illness for swimmers

By Susan Woodward
STAFF WRITER

Surfers have long suspected it, health officials have skirted it, and many tourists haven't even thought about it.

But finally there is an answer to the long-asked question: Can swimming in Santa Monica Bay make you sick?

In short, yes.

According to a report released Tuesday, people who swim in the ocean close to flowing storm drains have a 1 in 25 chance of developing a symptom such as fever, gastroenteritis, earache, nausea, vomiting, diarrhea, coughing, or a sore throat.

The epidemiological report — undertaken by USC School of Medicine Professor Robert Haile for the Santa Monica Bay Restoration Project — is the first to study the effects of urban runoff on human health.

Storm waters carry trash, fertilizers, gasoline and animal feces from city streets into the Los Angeles County storm-drain system, which empties the untreated runoff into San numerous outlets.

The report relies on beach surveys conducted last su 15,400 people who swam near the Ashland Avenue st Monica Beach, the Santa Monica Canyon storm drain a and at Surfrider Beach near Malibu Creek. All three loca

City of Santa Monica

Local tourism dampened by stream of bad news

Visitor industry threatened by L.A. image

Venice m
fund-rais
Art Walk set

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rning: *Beach bacteria hazard often*

ak

els frequently exceed
at some of the county's
eaches, but health offi-
arn swimmers or close
ed waters, the environ-
Heal the Bay charged

analysis of routine tests
ches along Santa Moni-
that bacteria levels ex-

Report card grades 48 beaches in the South Bay, Westside./A9

end of Ballona Creek in Playa del Rey.

But the county Department of Health Services has no policy to warn the public of the routine violations u less the contamination can be linked a sewage spill.

"Unless there is a known sewage lease, they don't want to do anythin said Mark Gold, staff scientist for t

"They fail to tell people about the routine violations."

County officials issued health warnings or closed beaches just 13 times since the beginning of 1989, despite evidence that bacteria standards are violated almost every day somewhere in the county.

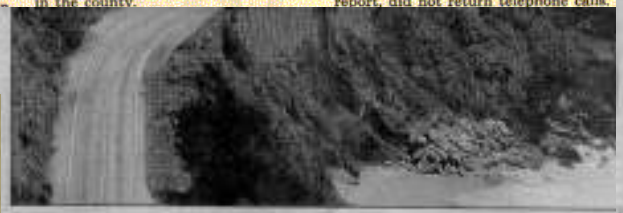
"It's the only protection the swimmer has," Gold said. "It's the only measuring stick we have to tell people whether there is a problem at their beach."

County officials, asked Friday to comment on an advance copy of the report, did not return telephone calls.

TESTING THE WATERS

Health of region's shores threatened by urban runoff

By Harrison Sheppard



The coast along Big Sur. Some officials said while the results were troubling, the wat

Beach Closings Reach Record Levels in State

■ **Environment:** Survey finds 3,547 instances of pollution problems last year.

By SEEMA MEHTA
TIMES STAFF WRITER

Our Times Times Santa Monica

Danger of urban runoff noted

■ Assemblyman Nakano tells folks at Venice meeting bill would address pollution caused by older roads.

Laura Wides
OUR TIMES

VENICE — A panel of experts including state Assemblyman George Nakano alerted local residents Tuesday night to the dangers of polluted urban runoff and its effect on Los Angeles beaches.

The Democrat, who represents Venice and a number of South Bay communities, urged

Examples of Local Urban Runoff

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Water Resources Management

Petroleum Derivatives

Wash Water & Fertilizers

Even the little things contribute to urban runoff

Caltrans reports that 20% of the material removed from freeway storm drain inlets is cigarette butts (UCLA Environmental Report Card 1999)

City Staff Working Together to Do More with Less

Open Spaces - Pets

Wastewater – CB/SD cleaning

Finance – parcel/runoff fees, grants

Engineering – BMP design in new projects; Airport gunite

Street Sweeping

Resource Management

Urban Runoff - EPD

Building & Safety - COOs

GIS – mapping CB/SDs, BMP locations

Planning – start of new project

Solid Waste – recycling/trash spills

Parks/Recs - irrigation

City Attorneys – ordinances, enforcement, contracts

Enforcement – wasting water, no BMPs, pollutant spills

Utilities – ind. waste, recycled water

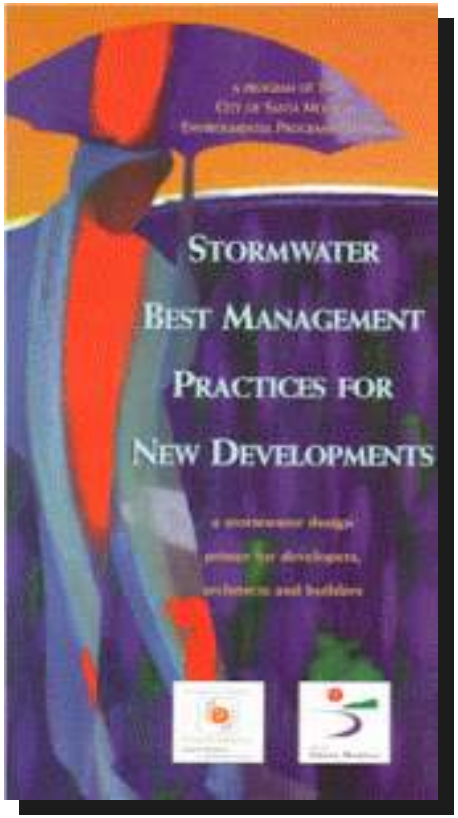
Tools of the Trade

- **Education**
- **Prevention**
- **Ordinances**
- **Treatment**
- **Maintenance**
- **Enforcement**
- **Funding**

EDUCATION & PREVENTION

- Brochures
- Radio / TV Spots
- Newspaper Articles/Ads
- City's Web Sites & Green Building Web Site
- Catch Basin Stencils/Tiles
- Educational Information at Facilities
- City Employee Training

Brochures and Handouts



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City's Web Site

www.santa-monica.org

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Water Resources Management

Pier/Catch Basin Signage

Pet Walk Parks

ORDINANCES

- Urban Runoff Pollution Code
- Stormwater Utility Parcel Code
- Local Building Code
- Local Zoning Code
- Sustainable City Code

Parcel Fee, UR Mitigation

- New Development & Runoff Mitigation Plan, including City projects
- Retain 0.75”
- Good Housekeeping BMPs
- Construction Site BMPs
- Penalties - $500/day
- Flexibility
- In-Lieu Fee/Mitigation Banking

- New Development Threshold: Value of new construction is 50% or greater compared to the replacement cost of the existing improvement
- Stricter standard than LA Regional Water Board Standard; all land uses
- About $1.2 million annually

Results Since 1993

- Number of Projects
- Single-Family: 240
- Multi-Family: 65
- Commercial: 70
- Unknown: 70
- City: 12
- BMP Ave. Costs: $0.50 - $3.50 per gallon, one-time
- <1.5% of total project cost

- Design Storage (gallons)
- Single-Family: 184,000
- Multi-Family: 130,000
- Commercial: 342,000
- City: 100,000

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City Council Meeting 11-28-00 Santa Monica, California

ORDINANCE NUMBER 1992 (CCS)

(City Council Series)

AN ORDINANCE OF THE CITY COUNCIL OF THE
CITY OF SANTA MONICA AMENDING CHAPTER 7.10
OF THE SANTA MONICA MUNICIPAL CODE RELATING
TO URBAN RUNOFF POLLUTION

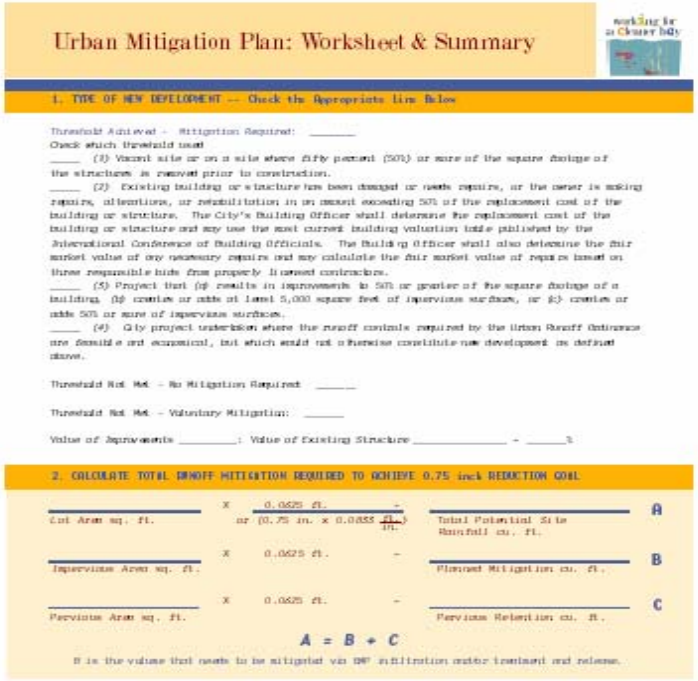
THE CITY COUNCIL OF THE CITY OF SANTA MONICA DOES HEREBY ORDAIN AS FOLLOWS:

SECTION 1. Chapter 7.10 of the Santa Monica Municipal Code is hereby amended to read as follows:

Chapter 7.10
URBAN RUNOFF POLLUTION

Section 7.10.010 Findings.

http://pen.ci.santa-monica.ca.us/municode/codemaster/Article_7/10/index.html



Urban Mitigation Plan: Worksheet & Summary

1. TYPE OF NEW DEVELOPMENT -- Check the Appropriate Line Below

Threshold Achieved – Mitigation Required: _____

Check which threshold used

_____ (1) Vacant site or on a site where fifty percent (50%) or more of the square footage of the structures is removed prior to construction.

_____ (2) Existing building or structure has been damaged or needs repairs, or the owner is making repairs, alterations, or rehabilitation in an amount exceeding 50% of the replacement cost of the building or structure. The City's Building Officer shall determine the replacement cost of the building or structure and may use the most current building valuation table published by the International Conference of Building Officials. The Building Officer shall also determine the fair market value of any necessary repairs and may calculate the fair market value of repairs based on three responsible bids from properly licensed contractors.

_____ (3) Project that (a) results in improvements in 50% or greater of the square footage of a building, (b) creates or adds at least 5,000 square feet of impervious surfaces, or (c) creates or adds 50% or more of impervious surfaces.

_____ (4) City project undertaken where the runoff controls required by the Urban Runoff Ordinance are feasible and economical, but which would not otherwise constitute new development as defined above.

Threshold Not Met – No Mitigation Required: _____

Threshold Not Met – Voluntary Mitigation: _____

Value of Improvements _____; Value of Existing Structure _____ = _____%

2. CALCULATE TOTAL RUNOFF MITIGATION REQUIRED TO ACHIEVE 0.75 inch REDUCTION GOAL

_____ Lot Area sq. ft.	X	0.0625 ft. or (0.75 in. x 0.0833 ft./in.)	=	_____ Total Potential Site Runoff cu. ft. A
_____ Impervious Area sq. ft.	X	0.0625 ft.	–	_____ Planned Mitigation cu. ft. B
_____ Pervious Area sq. ft.	X	0.0625 ft.	–	_____ Pervious Retention cu. ft. C

A = B + C

D is the volume that needs to be mitigated via BMP infiltration and/or treatment and release.

Urban Mitigation Plan: Worksheet & Summary continued

5. MITIGATION MEASURES OR BEST MANAGEMENT PRACTICES (BMPs) USED TO ACHIEVE 0.75 INCH REDUCTION

(attach drawings if available)

REQUIRED FIGURES FOR SUBMISSION WITH PLAN (these specific figures are kept confidential):

- INCLUDE TOTAL AREA OF ROOF AND ANY OTHER IMPERMEABLE AREAS DIRECTED TO THE BMP (where applicable) _____
- INCLUDE TOTAL AREA OF LANDSCAPING (permeable areas) _____
- INCLUDE AREA OF PERMEABLE PAVING USED AS BMP* (where applicable) _____
- INCLUDE TOTAL COST or ESTIMATE OF BMP(s) (labor and materials) _____
- INCLUDE TOTAL PROJECT COST _____
- INCLUDE TOTAL VOLUME CAPACITY OF BMP(s) _____

* This area is component of above landscaping area.

4. LIST REQUIRED BMP POLLUTION CONTROL DEVICES USED (add attached sheets or drawings if necessary).

5. WHAT IS THE MAINTENANCE PLAN?

6. PROJECT PLAN INFORMATION

PROPERTY OWNER/ADDRESS _____

_____

ALTERNATE ADDRESS DURING CONSTRUCTION: _____

_____

Anticipated Start Date:

Report Prepared by: _____ Date: _____

Architect Address, Phone/Fax/E-Mail Numbers:

Contractor Address, Phone/Fax/E-Mail Numbers:

I hereby agree that I will complete all runoff mitigation measures described herein prior to completion of project.

Property Owner or Authorized Representative

Signature: _____ Date: _____

Print Name: _____

City Approval: _____ Date: _____

You need to call the City's Urban Runoff Coordinator before completion of your BMP so that the BMP can be inspected for approval. You will NOT receive a Certificate of Occupancy without this approval.

Design Standard: 0.75 inch storm event

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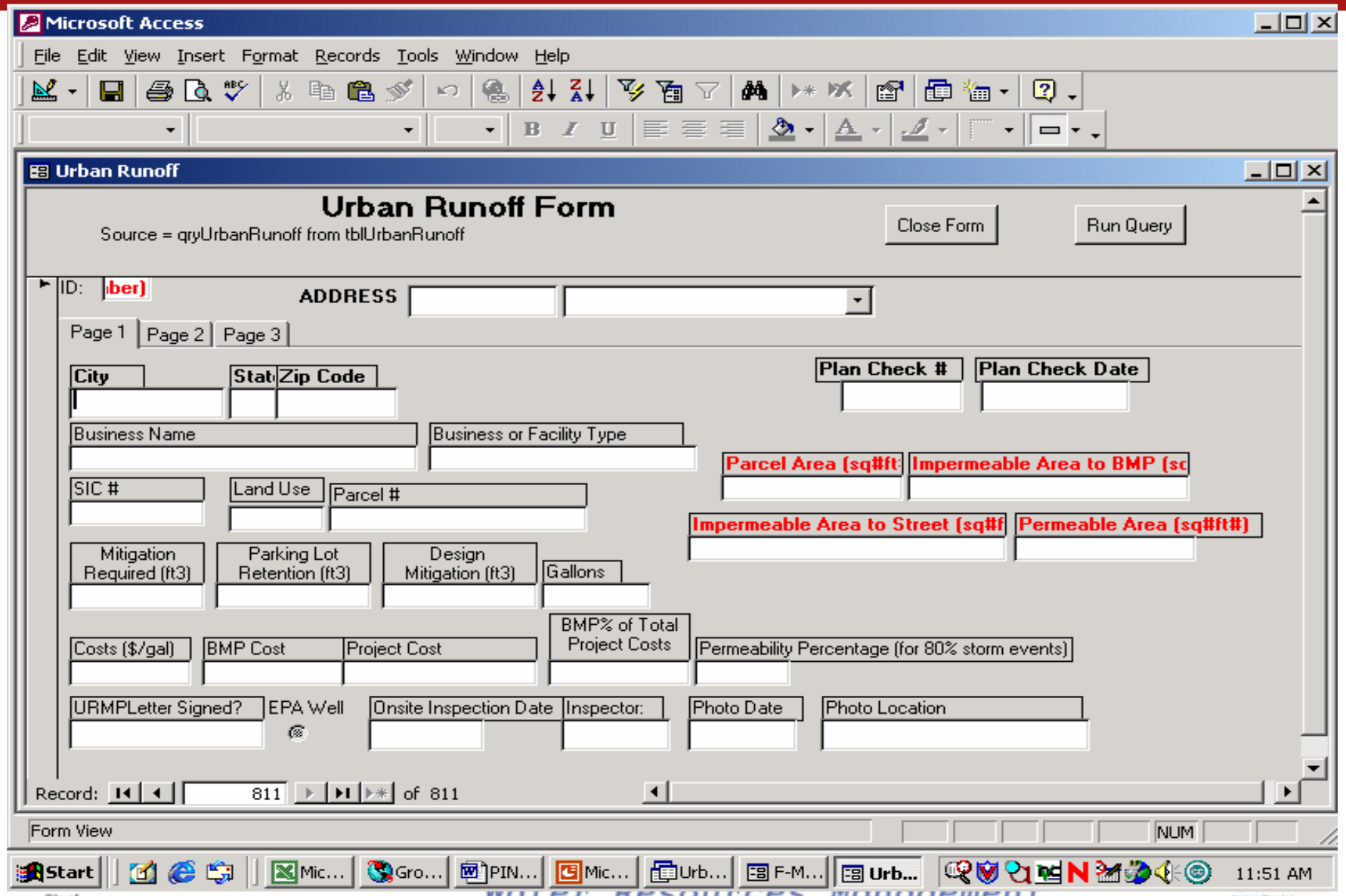
Example Best Management Practices (BMPs)

The following are examples of BMPs that can be used for minimizing the introduction of pollutants of concern, which may result in significant impacts and are generated from site runoff, into the storm water conveyance system.

- Provide reduced width sidewalks and incorporate landscaped buffer areas between sidewalks and streets. However, sidewalk widths must still comply with regulations for the Americans with Disabilities Act and other life-safety requirements.
- Design residential streets for the minimum required pavement widths needed to comply with all zoning and applicable ordinances to support travel lanes; on-street parking; emergency, maintenance, and service vehicle access; sidewalks; and vegetated open channels.
- Comply with all zoning and applicable ordinances to minimize the number of residential street, cul-de-sacs and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.
- Use permeable materials for private sidewalks, driveways, parking lots, or interior roadway surfaces. Examples: hybrid lots, parking groves, permeable overflow parking, modular pavers (plastic, concrete, etc.).
- Use open space development that incorporates smaller footprint building sizes.
- Reduce building density.
- Comply with all zoning and applicable ordinances to reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.
- Comply with all zoning and applicable ordinances to reduce the overall imperviousness associated with parking lots by permitting compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in parking areas.
- Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas, and avoid routing rooftop runoff to the roadway or the storm water conveyance system.
- Vegetated swales and strips/biofilters
- Extended/dry detention basins
- Infiltration basins/trenches
- Wet ponds
- Constructed wetlands
- Oil/Water separators/clarifiers
- Catch basin inserts/screens
- Storm drain inserts/screens
- Vortex-type flow deflection, separation systems
- Media Filtration
- Bioretention Facility
- Drywells
- Cisterns
- Foundation planting
- Normal flow storage/ separation systems
- Filtration systems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Business Name
Business or Facility Type
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SIC #
Land Use
Parcel #
Impermeable Area to Street (sq#f
Permeable Area (sq#ft#)
Mitigation Required (ft3)
Parking Lot Retention (ft3)
Design Mitigation (ft3)
Gallons
Costs ($/gal)
BMP Cost
Project Cost
BMP% of Total Project Costs
Permeability Percentage (for 80% storm events)
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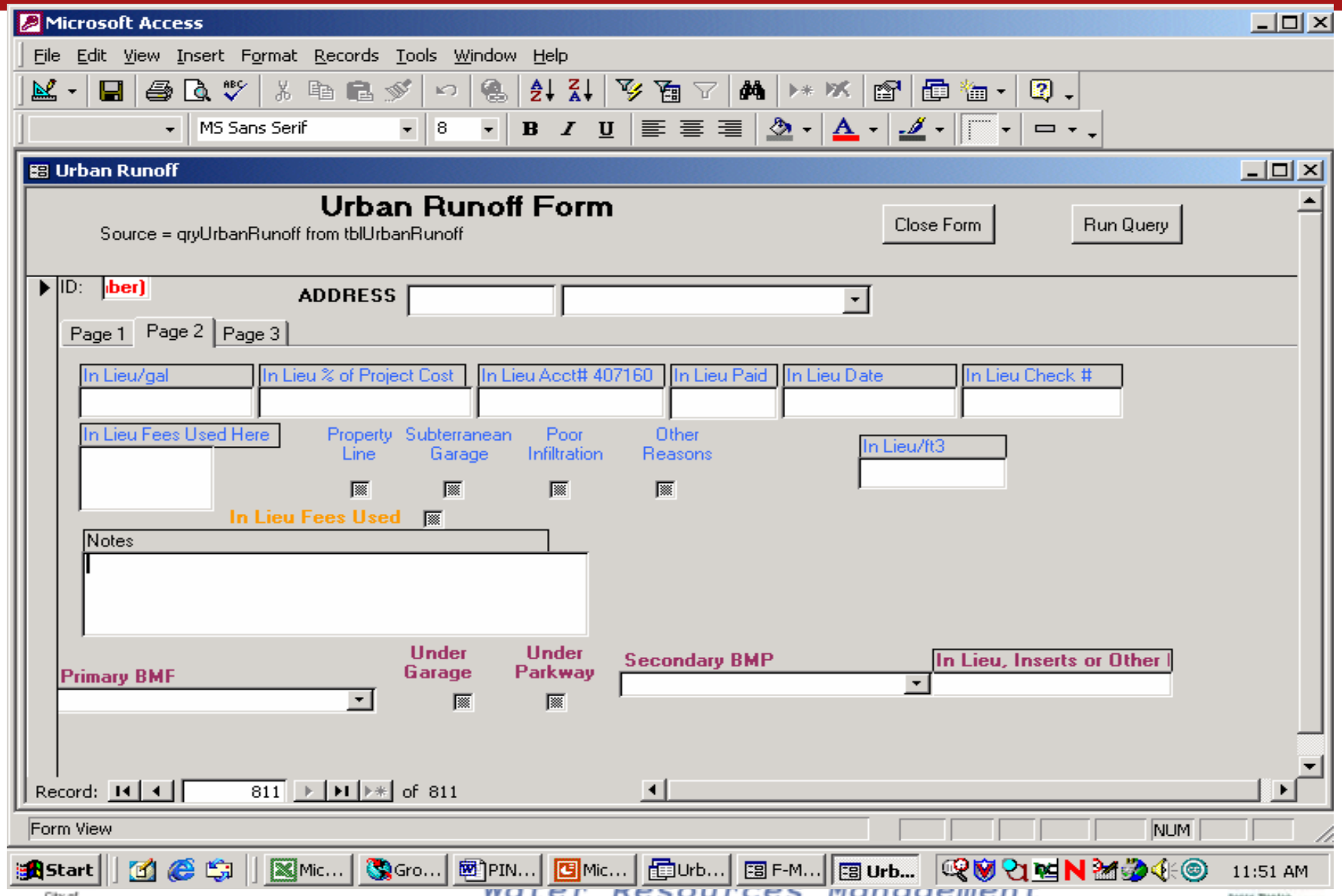
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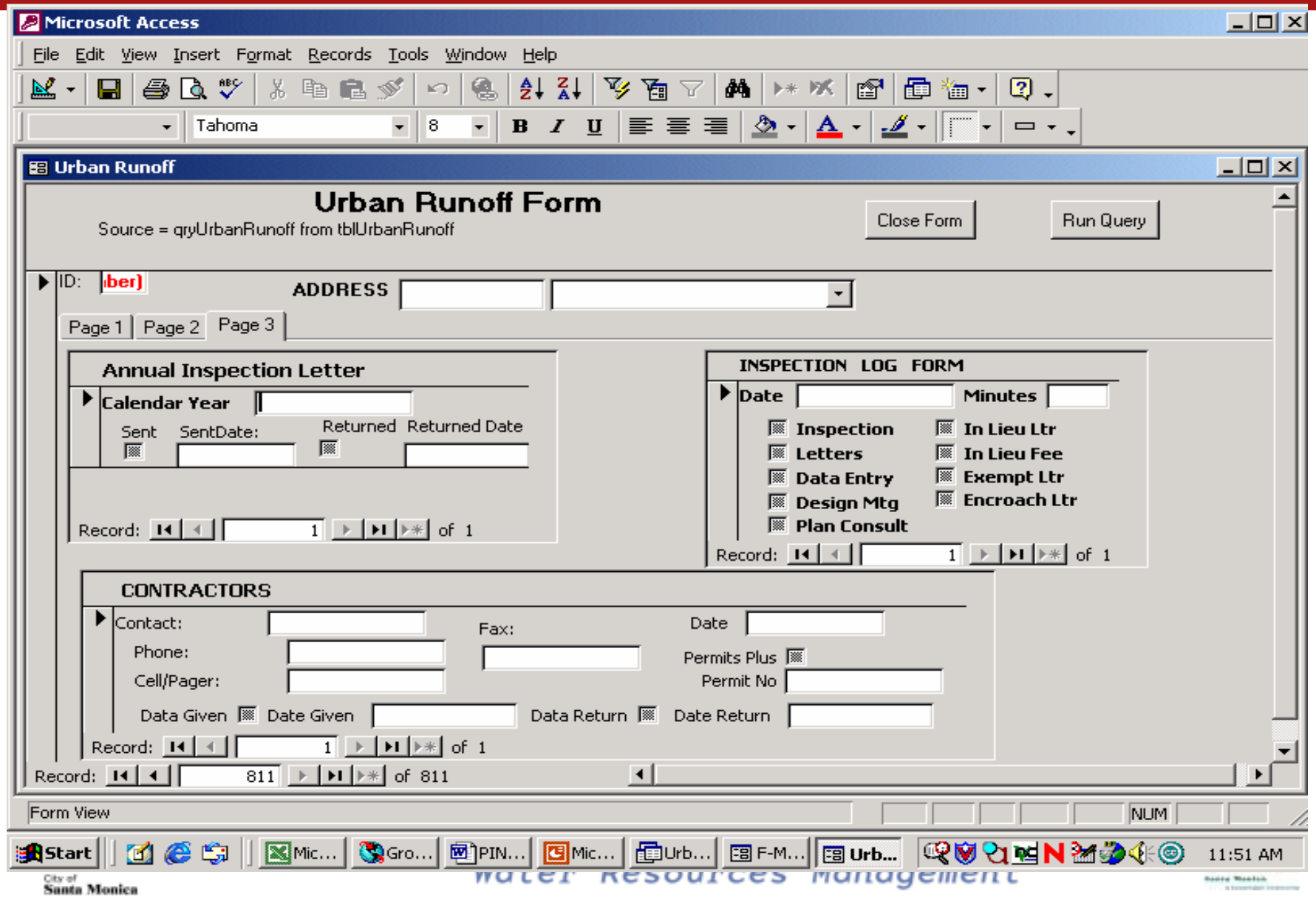
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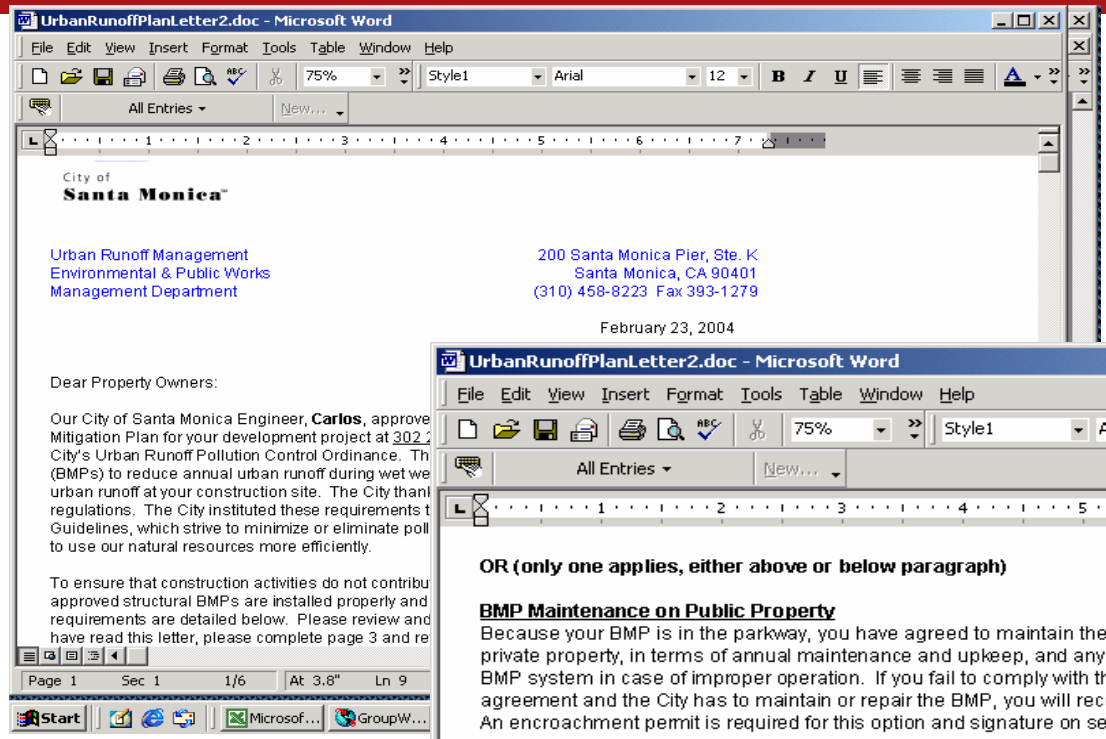

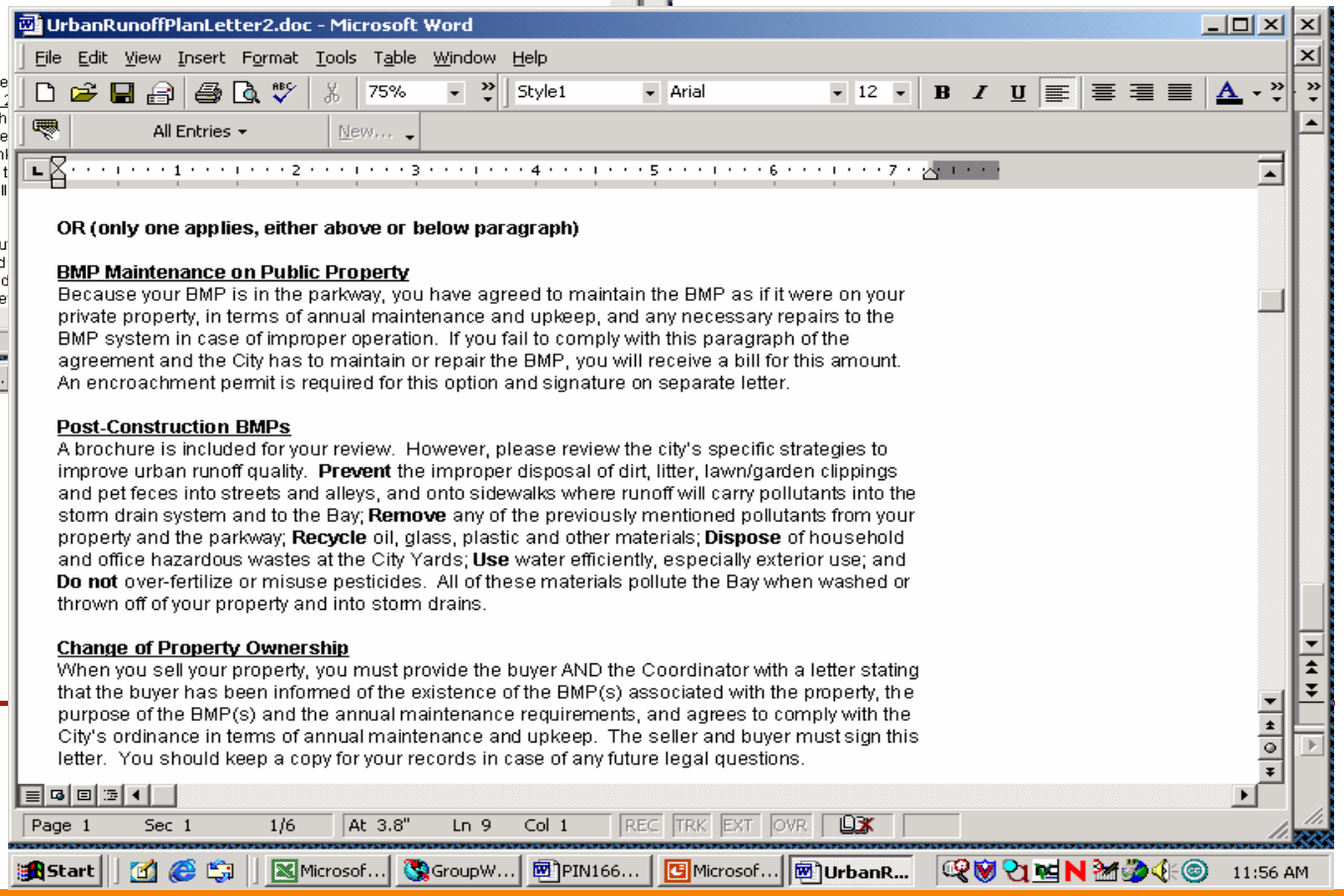

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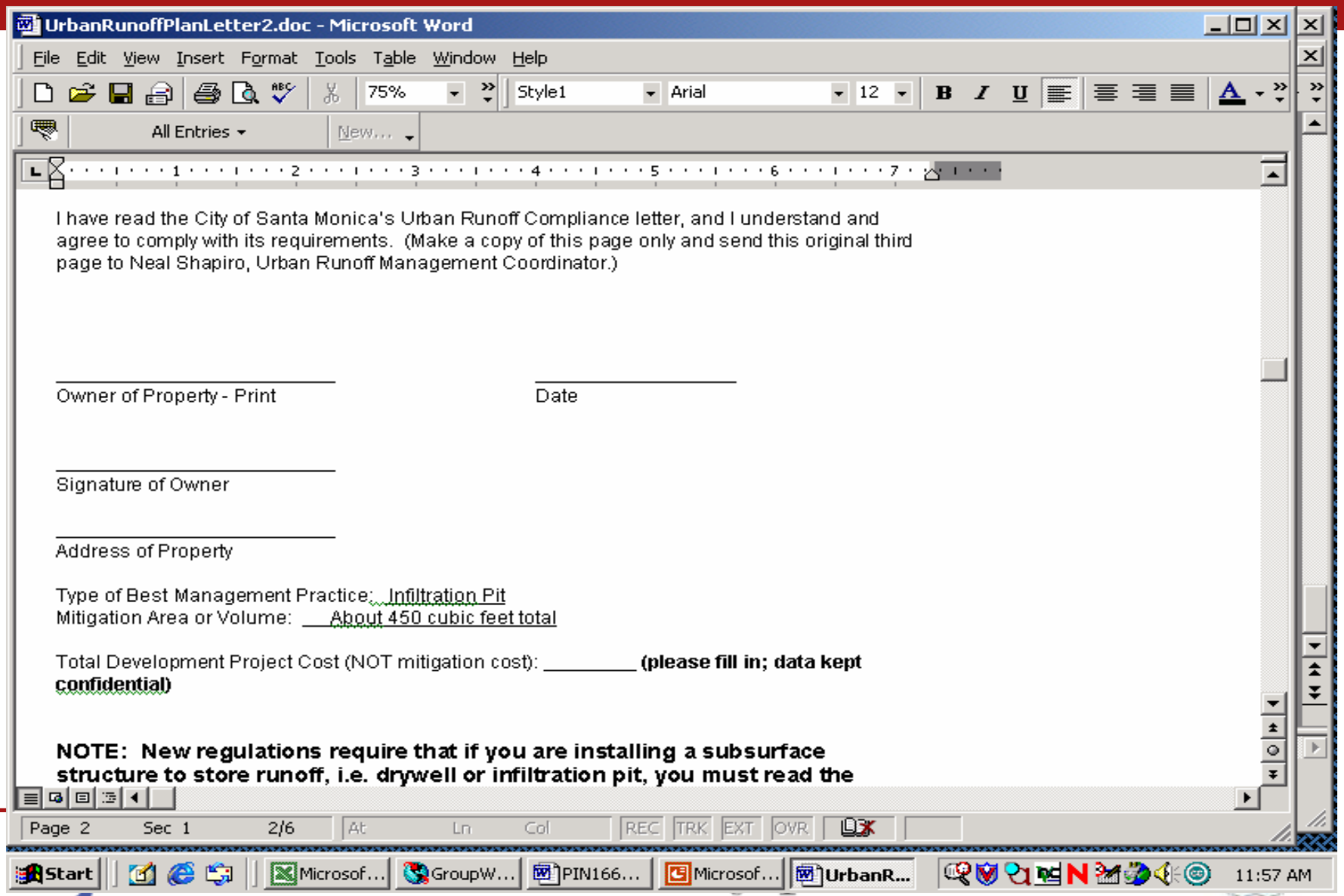
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All Entries
New...
I have read the City of Santa Monica's Urban Runoff Compliance letter, and I understand and agree to comply with its requirements. (Make a copy of this page only and send this original third page to Neal Shapiro, Urban Runoff Management Coordinator.)
Owner of Property - Print
Date
Signature of Owner
Address of Property
Type of Best Management Practice: Infiltration Pit
Mitigation Area or Volume: About 450 cubic feet total
Total Development Project Cost (NOT mitigation cost): _____ (please fill in; data kept confidential)
NOTE: New regulations require that if you are installing a subsurface structure to store runoff, i.e. drywell or infiltration pit, you must read the
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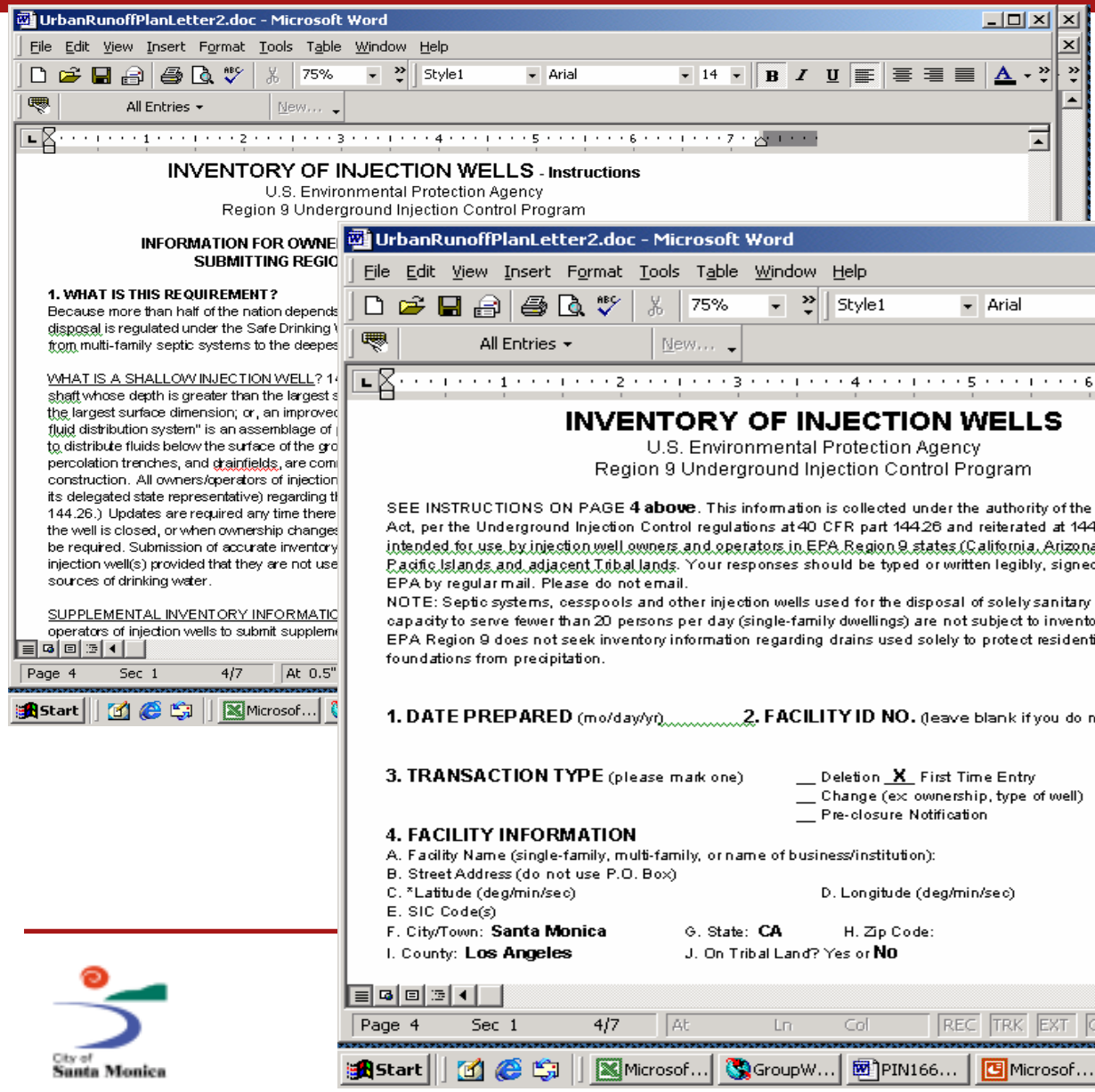


City of Santa Monica

Inspections

March 4, 2004

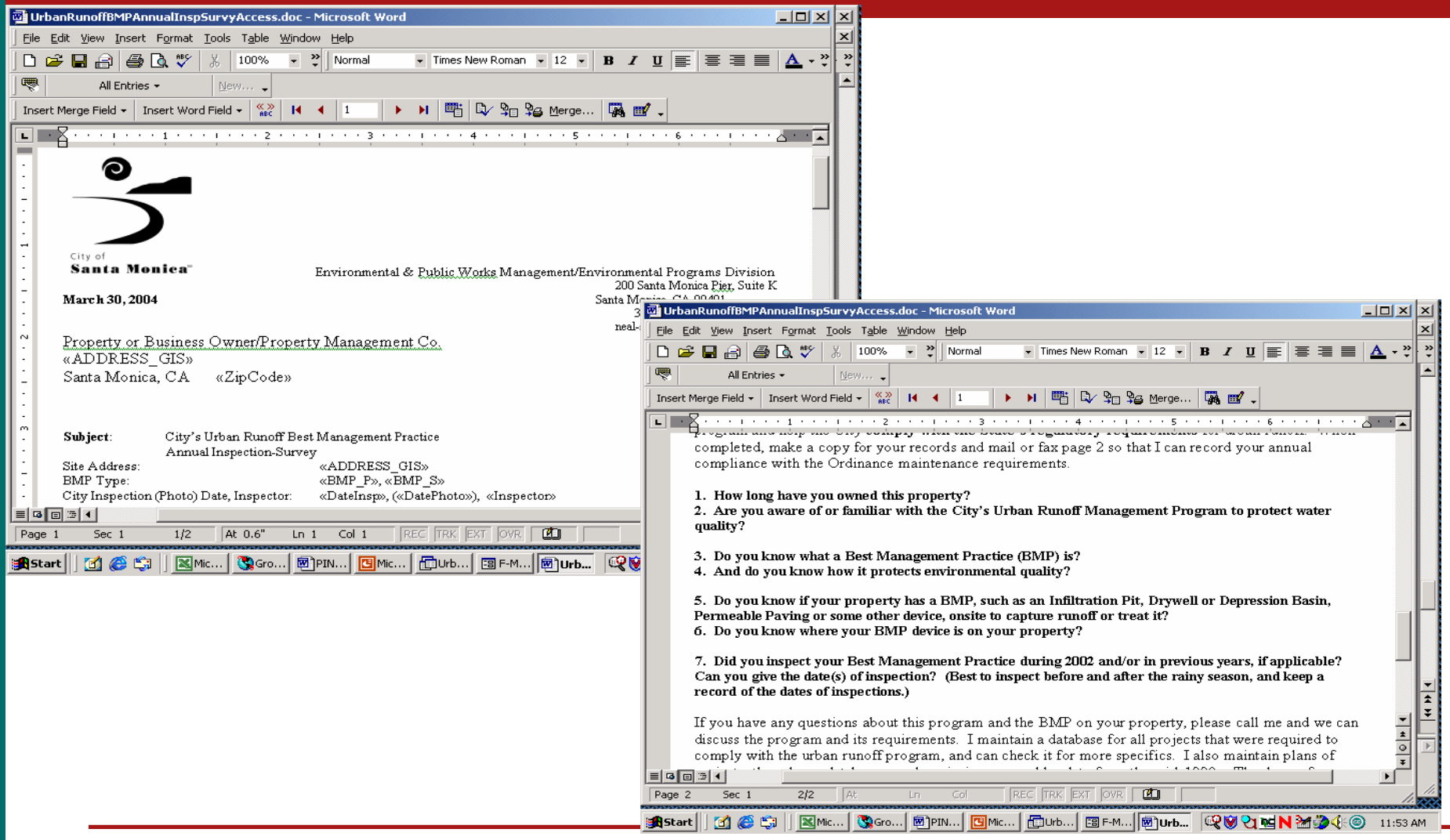
Site Location: _____

Dear Contractor/Developer/Architect:

For the location listed above, I require some data for the City's database on urban runoff mitigation and your solution (BMP). This information is kept strictly confidential.

- ☐ Need the STORAGE volume (cubic ft.) of the drywell, depression basin, or french drain (the BMP)
- ☐ **(1)** Need the area (sq. ft.) of impermeable surfaces (i.e. roof, hardscapes) draining directly into the BMP and/or landscape
- ☐ **(2)** Need the area (sq. ft.) of impermeable surfaces NOT draining into BMP but directly to the street
- ☐ **(3)** Need the area (sq. ft.) of landscaping, (turf, non-turf vegetation and any other permeable surfaces, that is, non-plant such as permeable paving, and including any hardscapes that sheetflow to the landscape)
- ☐ **(1) +(2) + (3) = total property or parcel area**
- ☐ Need cost of the BMP(s), including labor and materials
- ☐ Need the total/all project construction cost (do not include value of land)
- ☐ Need mailing address of property owner if different from project site

Please return ASAP, via fax or mail so I can close my file on your permit. If questions, e-mail or



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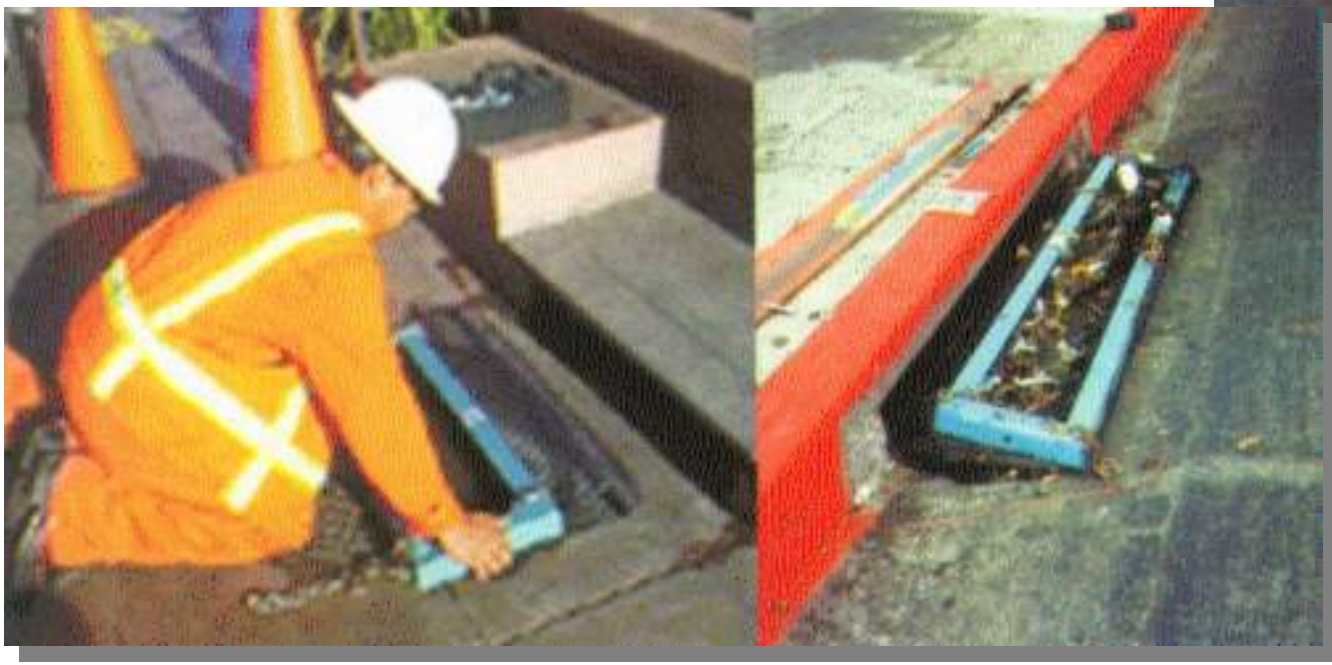
Water Resources Management

TREATMENT – Local

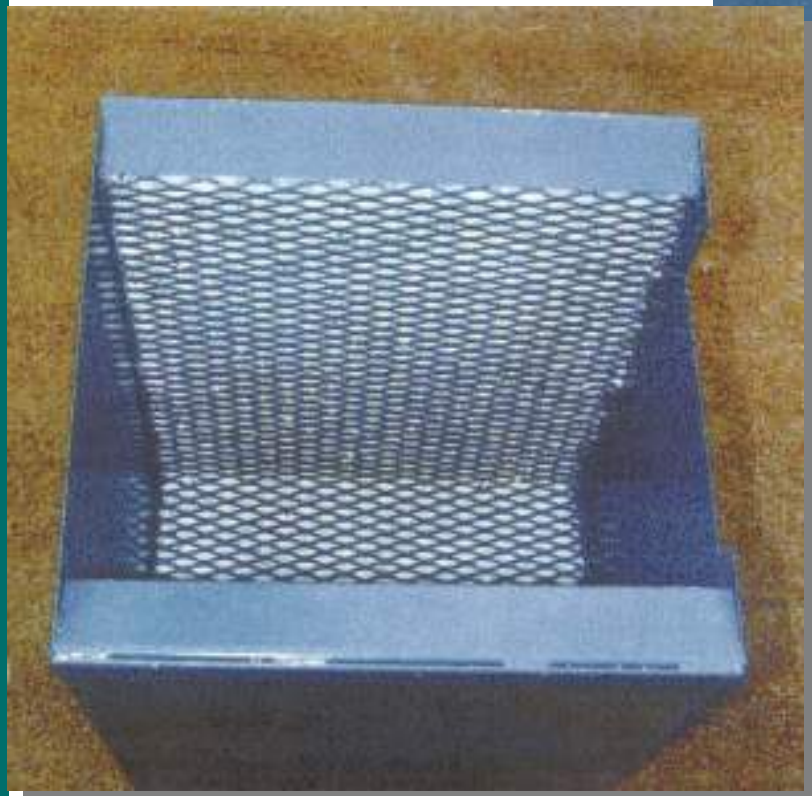
- Catch Basin/Storm Drain Inserts

Catch Basin Screens

Screening Catch Basin Insert



Filtering Catch Basin Insert



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Water Resources Management

Onsite Basin with Trash Insert

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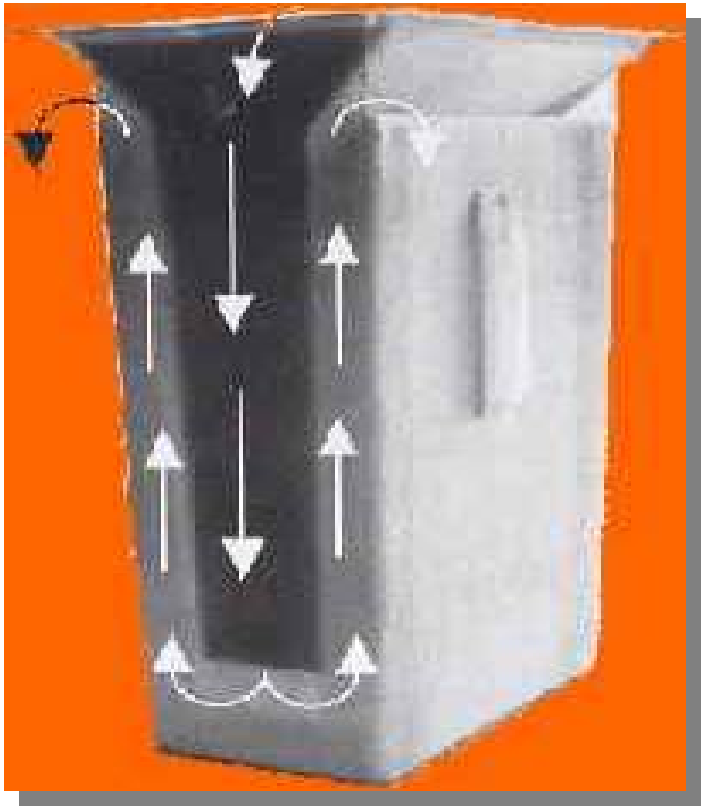
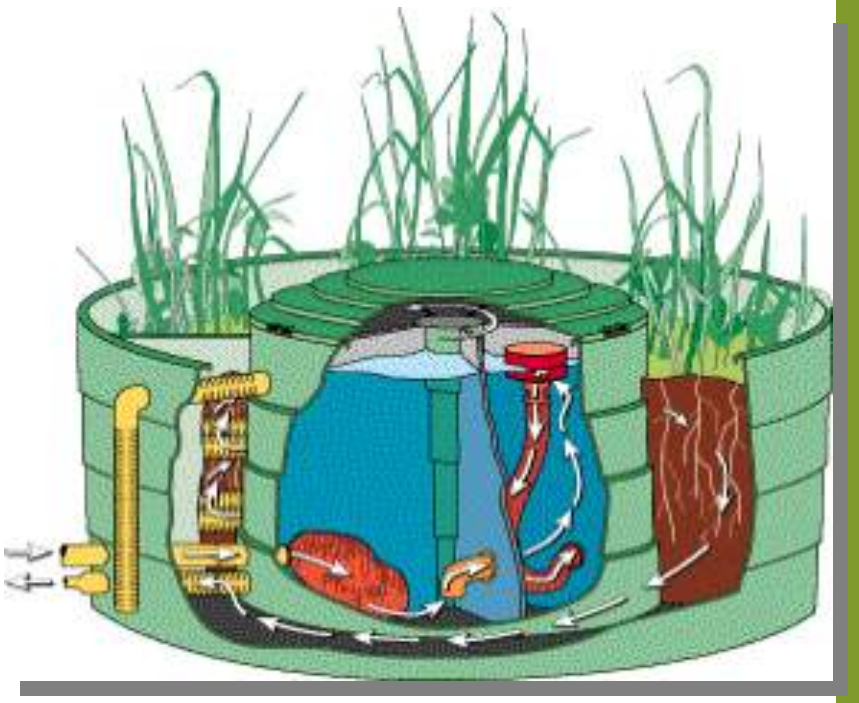
Water Resources Management

Onsite Basin with Filter Insert



Onsite Basin with Filter Insert



TREATMENT – Large Area

- Separation and Filtering (in-line) Devices
- Devices installed as maintenance holes or diversion structures
- Infiltration fields
- Porous surfaces

Separation Device

Trash, debris, sediments, oil, grease

City of Santa Monica

Filtering Device –

solubles: metals, organics, nutrients

Onsite Retention

City Facilities

Virginia Avenue Park

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Water Resources Management

Main Library

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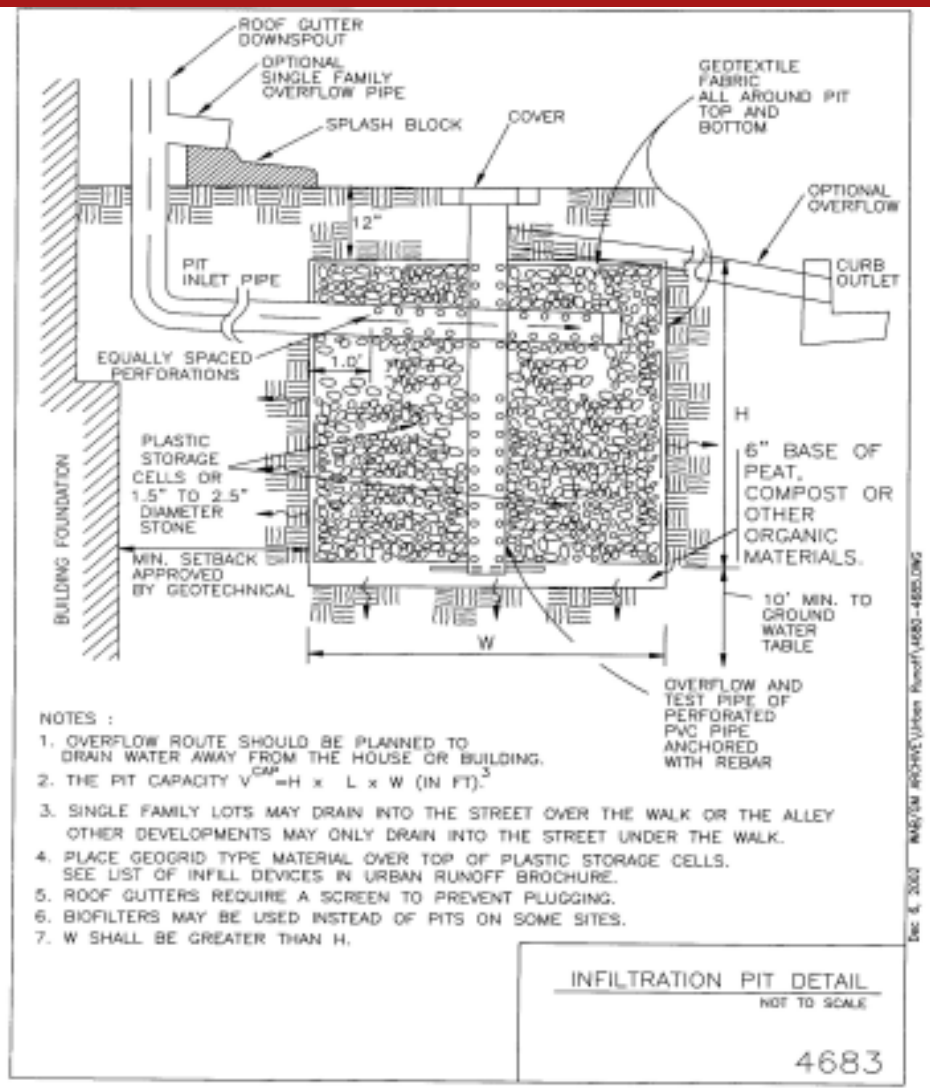
TREATMENT – Small Scale Privates

- Infiltration fields
- Porous surfaces



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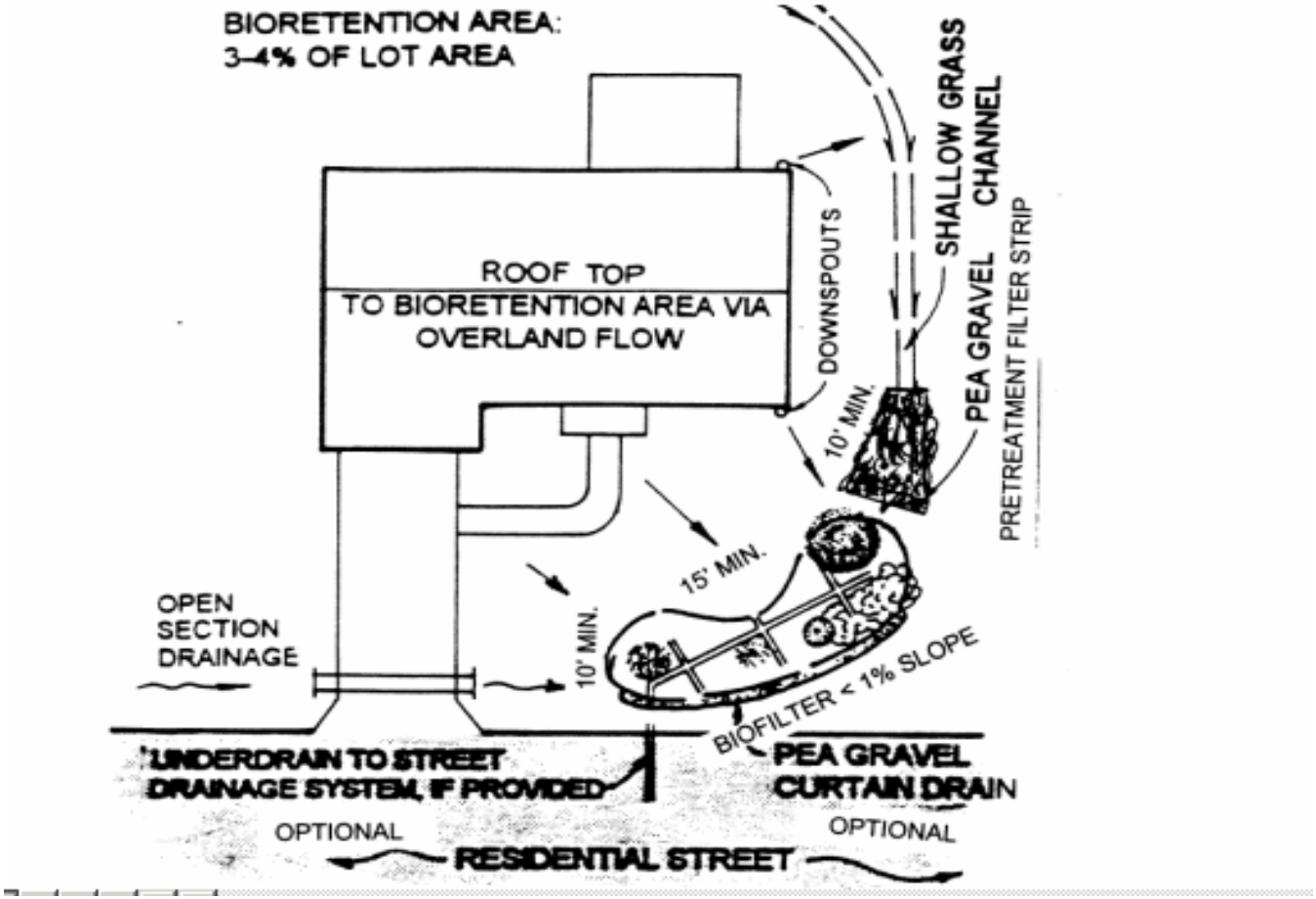
Water Resources Management


BIORETENTION AREA:
3-4% OF LOT AREA
ROOF TOP
TO BIORETENTION AREA VIA
OVERLAND FLOW
DOWNSPOUTS
SHALLOW GRASS
CHANNEL
PEA GRAVEL
PRETREATMENT FILTER STRIP
10' MIN.
15' MIN.
10' MIN.
OPEN
SECTION
DRAINAGE
BIOFILTER < 1% SLOPE
UNDERDRAIN TO STREET
DRAINAGE SYSTEM, IF PROVIDED
PEA GRAVEL
CURTAIN DRAIN
OPTIONAL
OPTIONAL
RESIDENTIAL STREET

Onsite Retention-private businesses

Drywell BMPs-single/multi- family

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Water Resources Management

Infiltration Pits BMPs

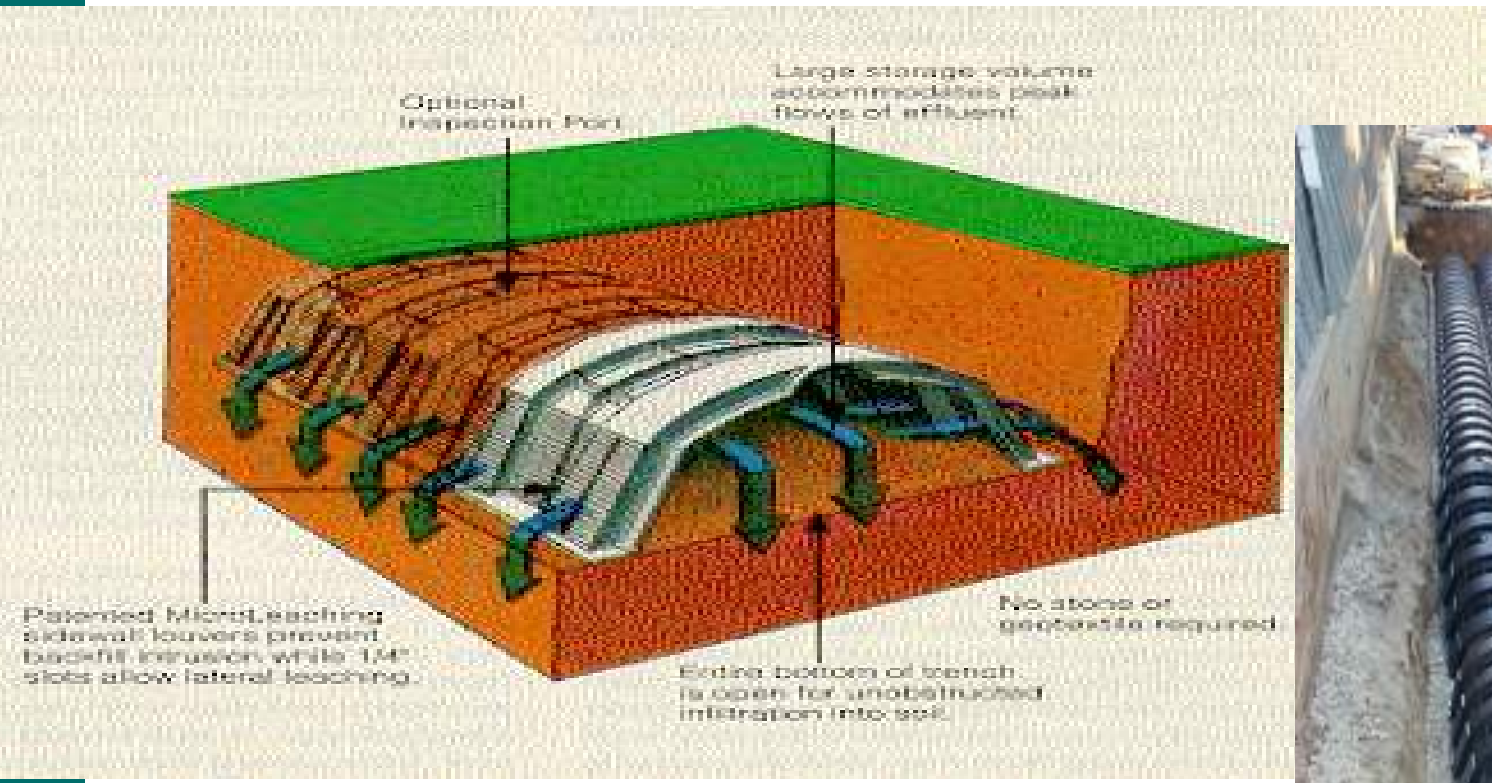
Onsite Retention

Onsite Retention

Storm Cell

Onsite Retention

Infiltrators



Big Blue Bus – Cultec

Big Projects

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Water Resources Management

Permeable Paving

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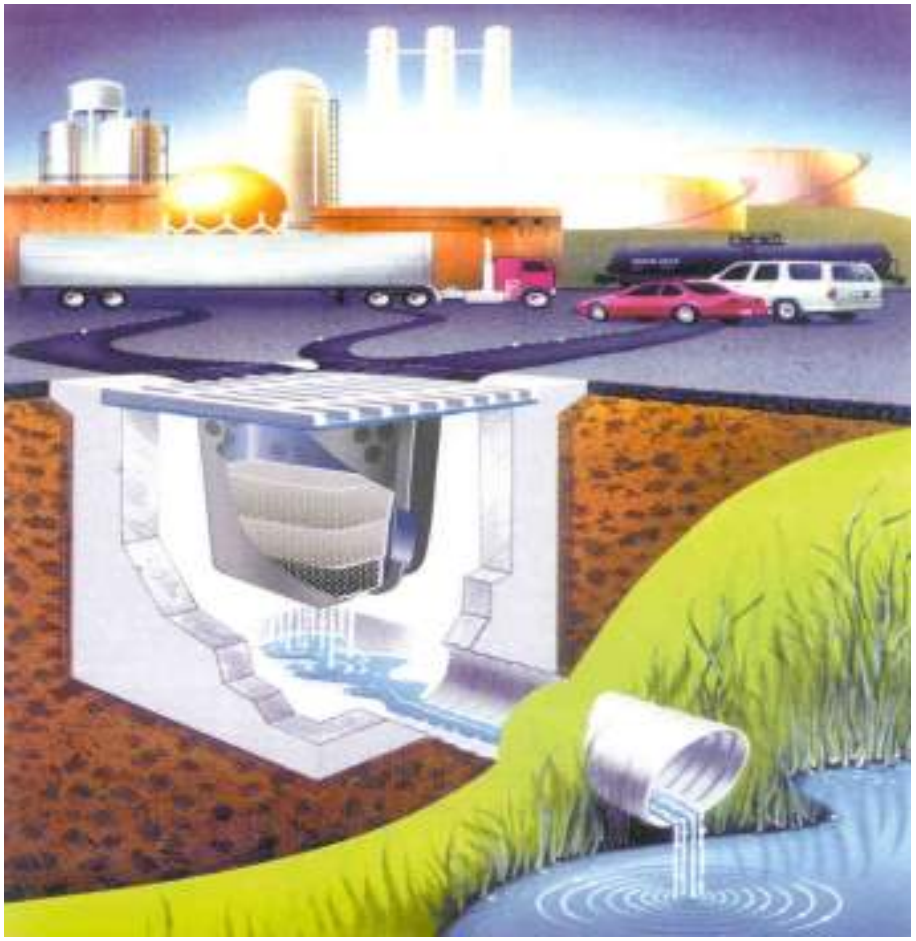
Water Resources Management

Use of Parkways



Parkway Infiltration

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Santa Monica

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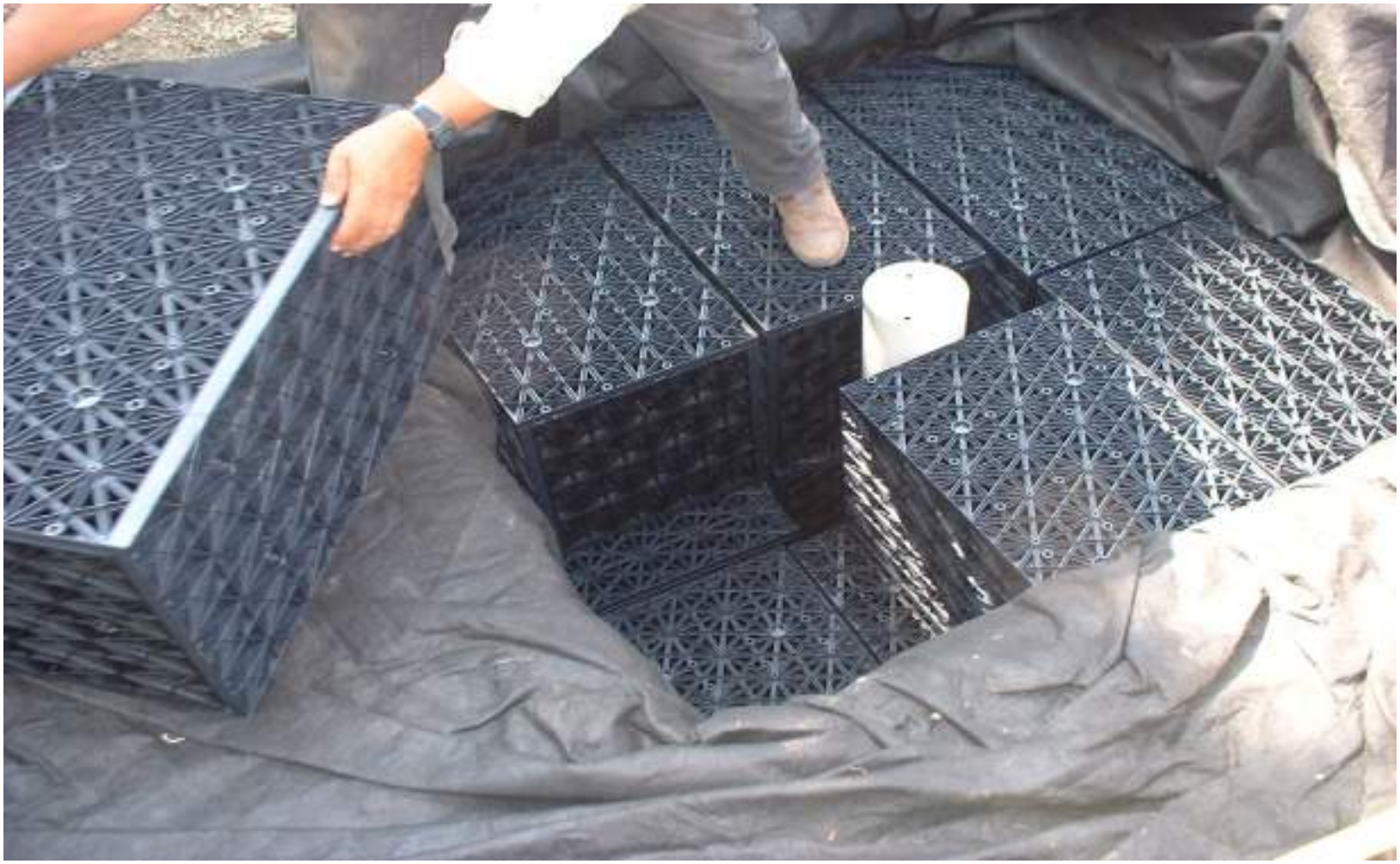
Atlantis tanks



Driveways and Runoff

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Water Resources Management

Rain Barrel Pilot Program - Disconnect

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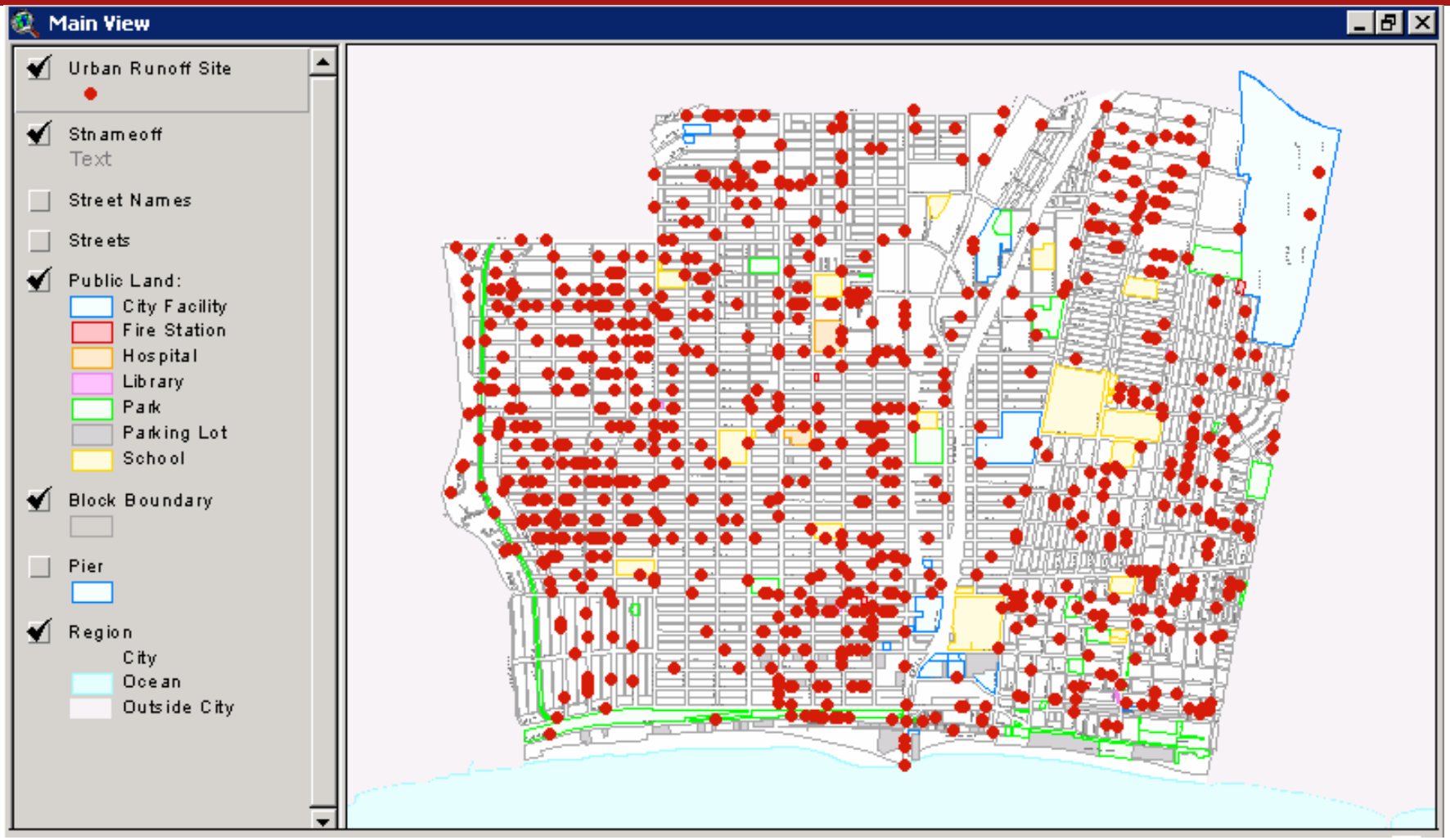
Water Resources Management



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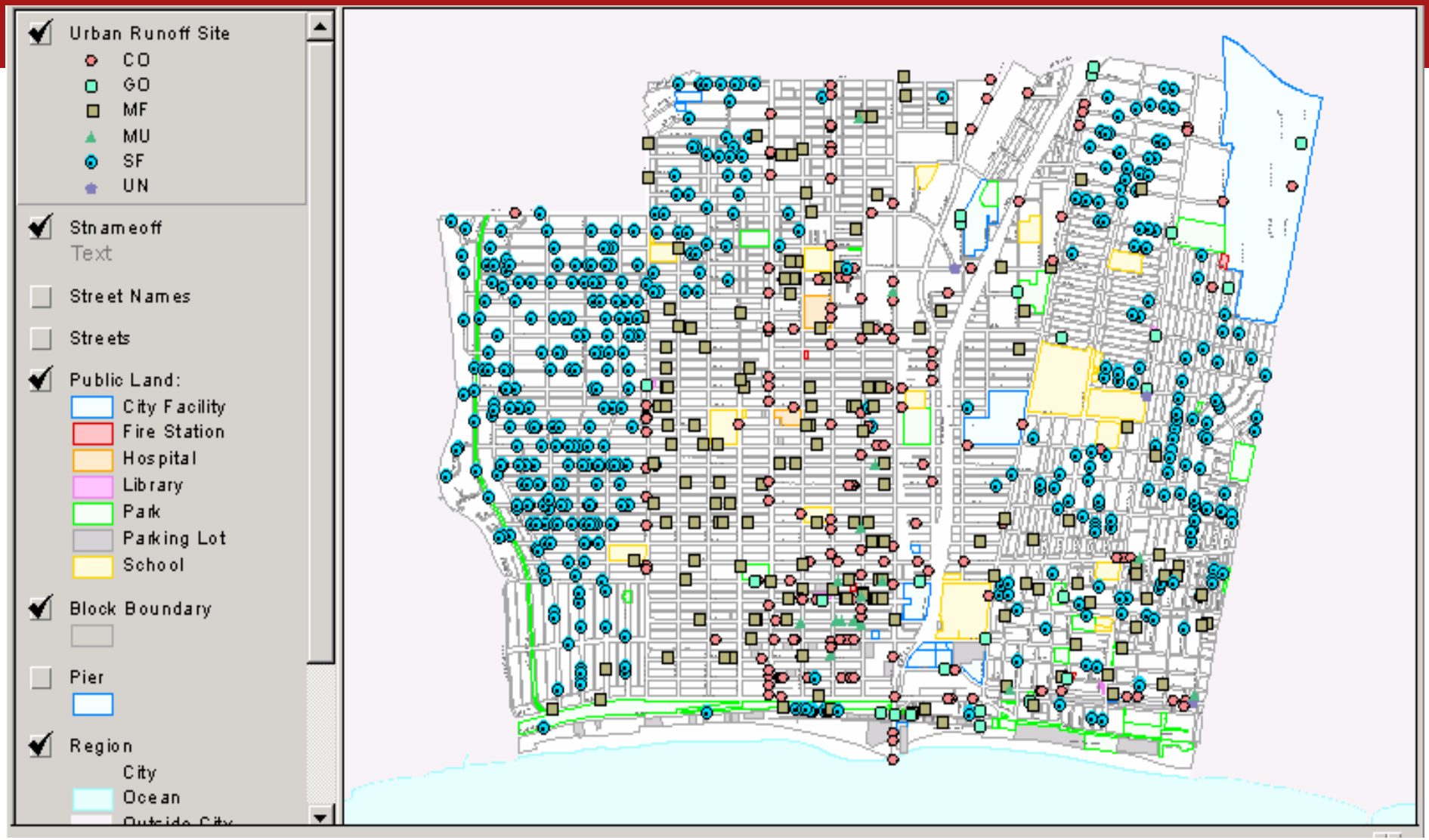
Water Resources Management



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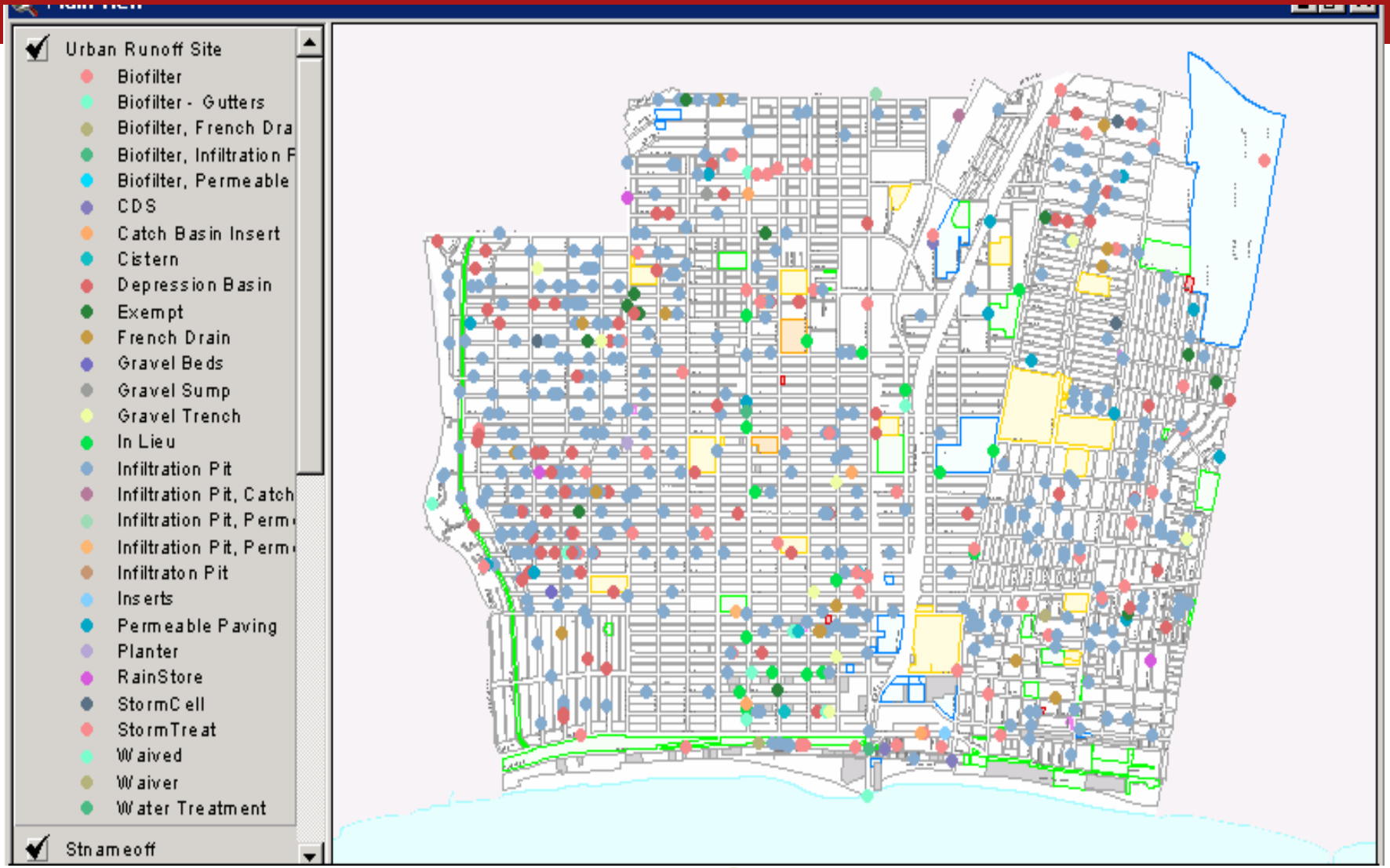
Water Resources Management



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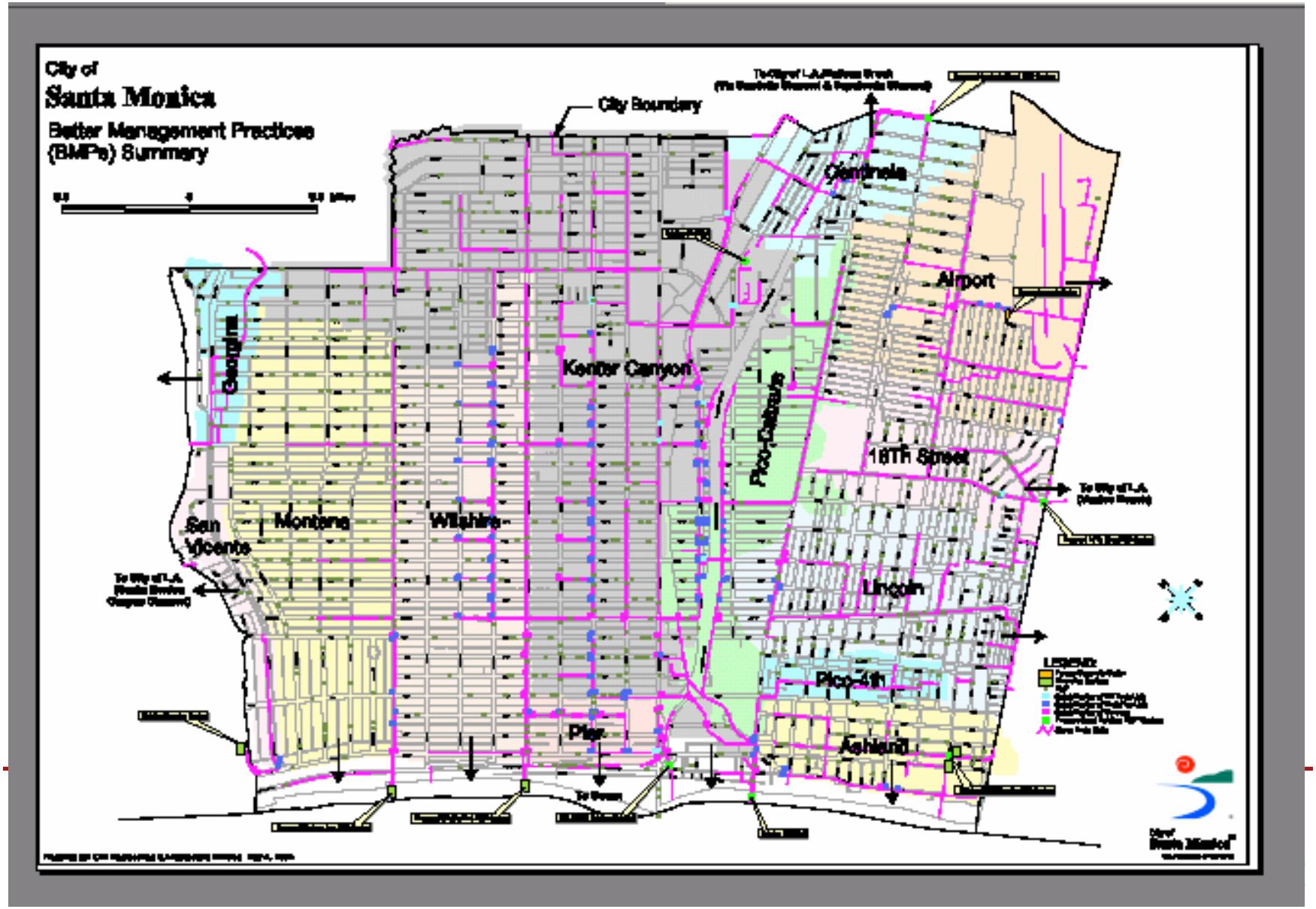
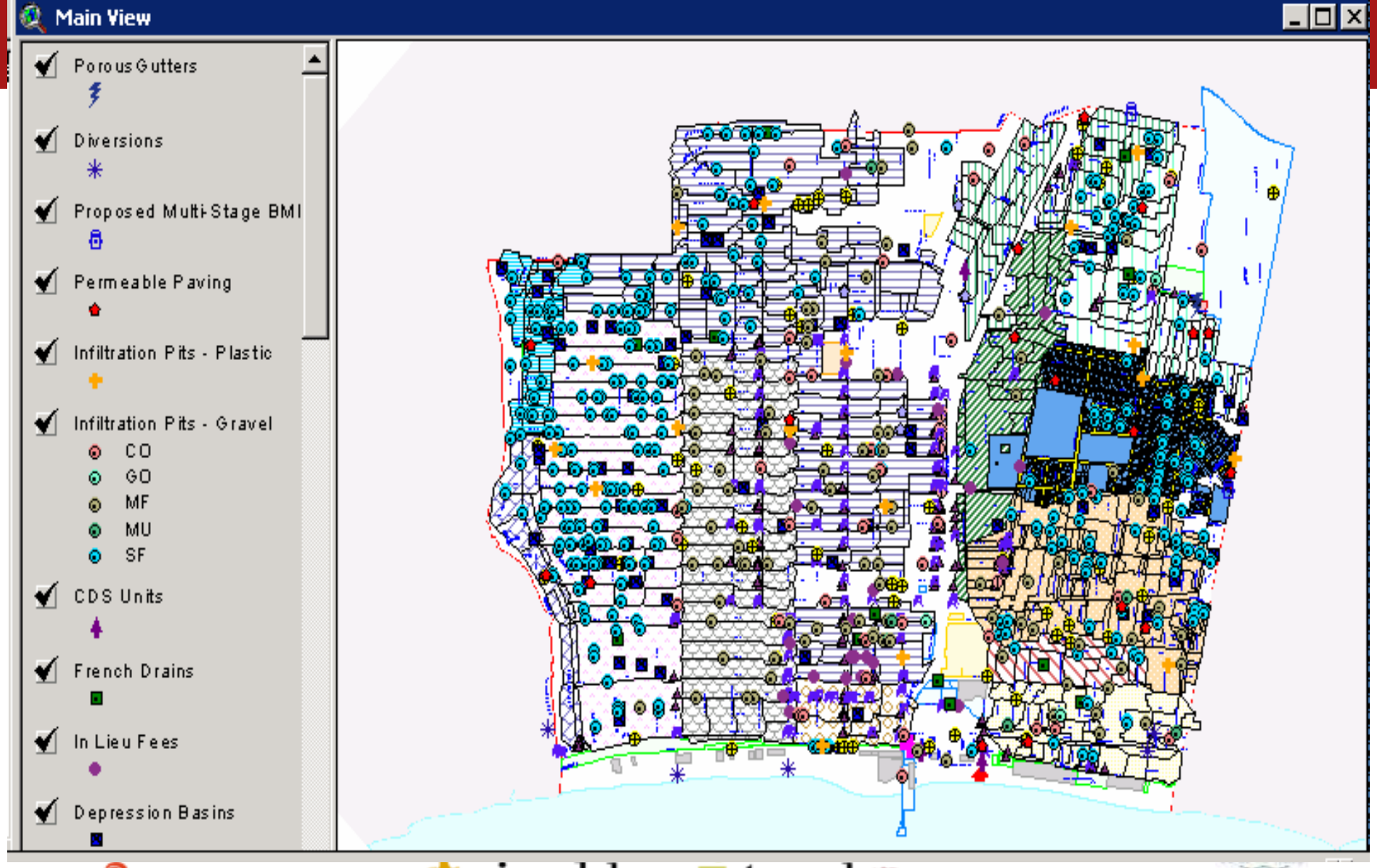
Water Resources Management


City of
Santa Monica
Better Management Practices
(BMPs) Summary
City Boundary
Centinela
Airport
Kenter Canyon
Pico-Kenter
18TH Street
Lincoln
Pico-4th
Ashland
Pier
San Vicente
Montana
Wilshire
Georgina
LEGEND:



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Water Resources Management

Centinela Pico-Pearl Project

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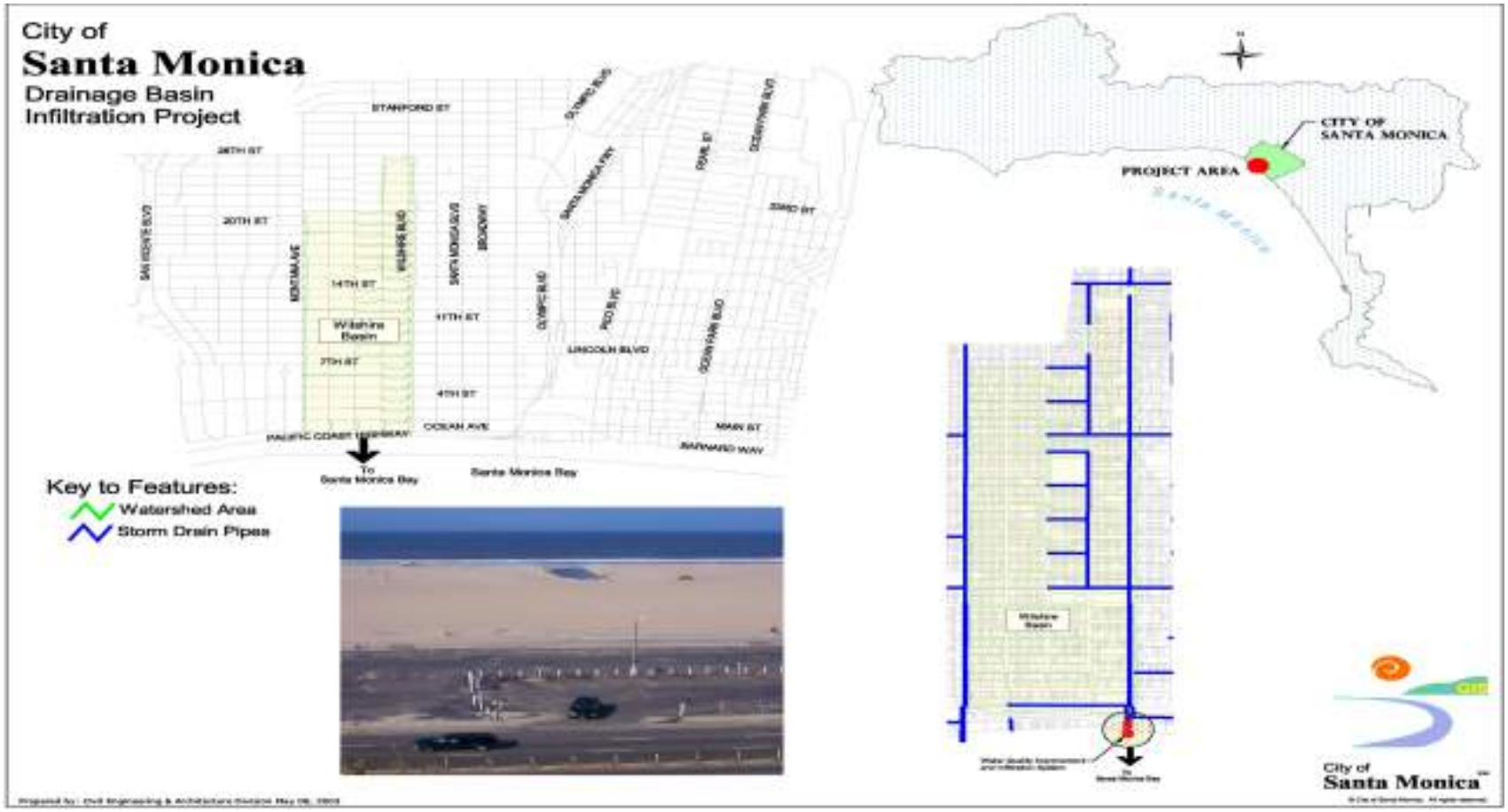
Water Resources Management

Montana/Wilshire Projects



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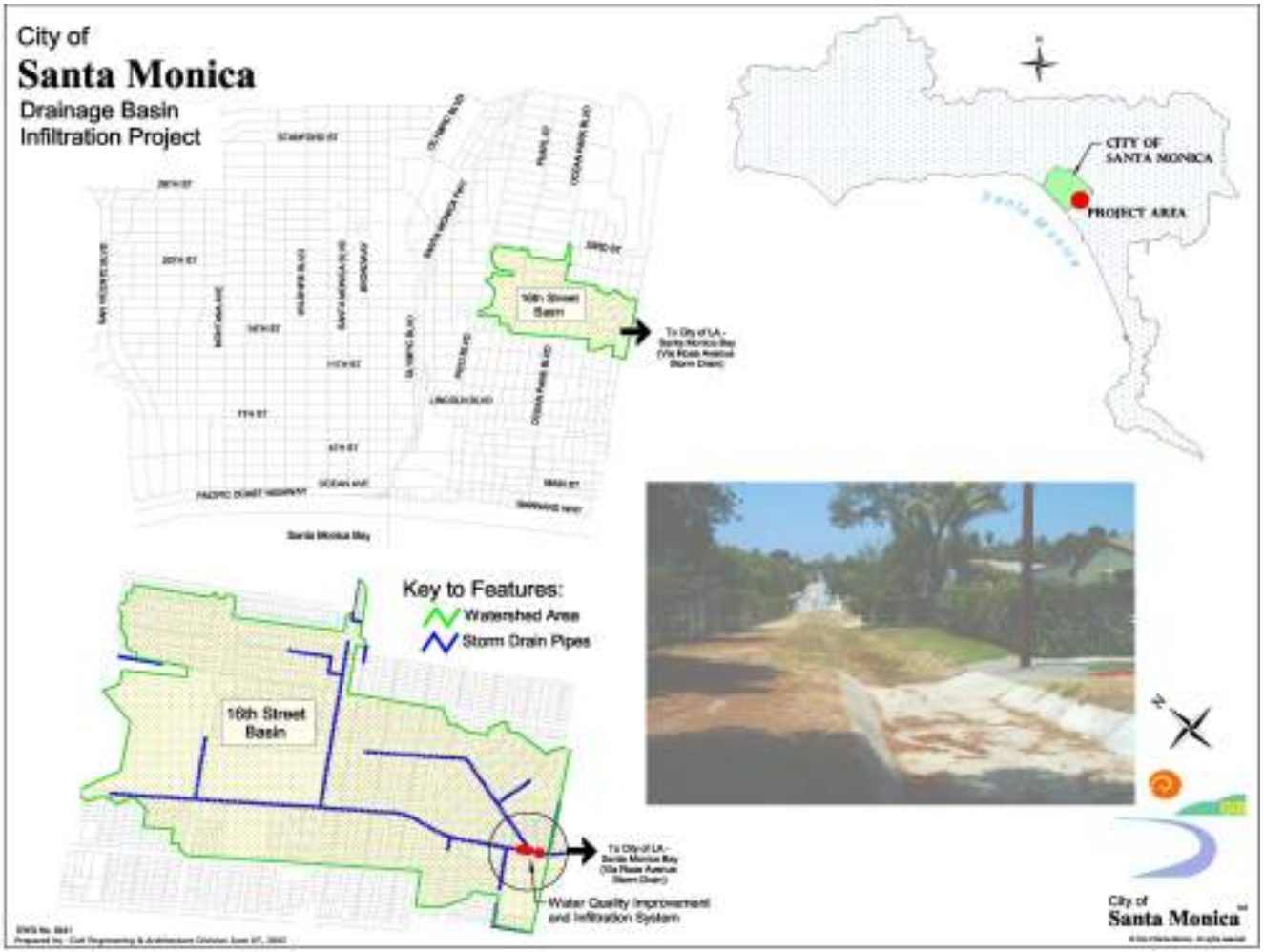
Water Resources Management

16th Street Project



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Water Resources Management

Green Beaches Project

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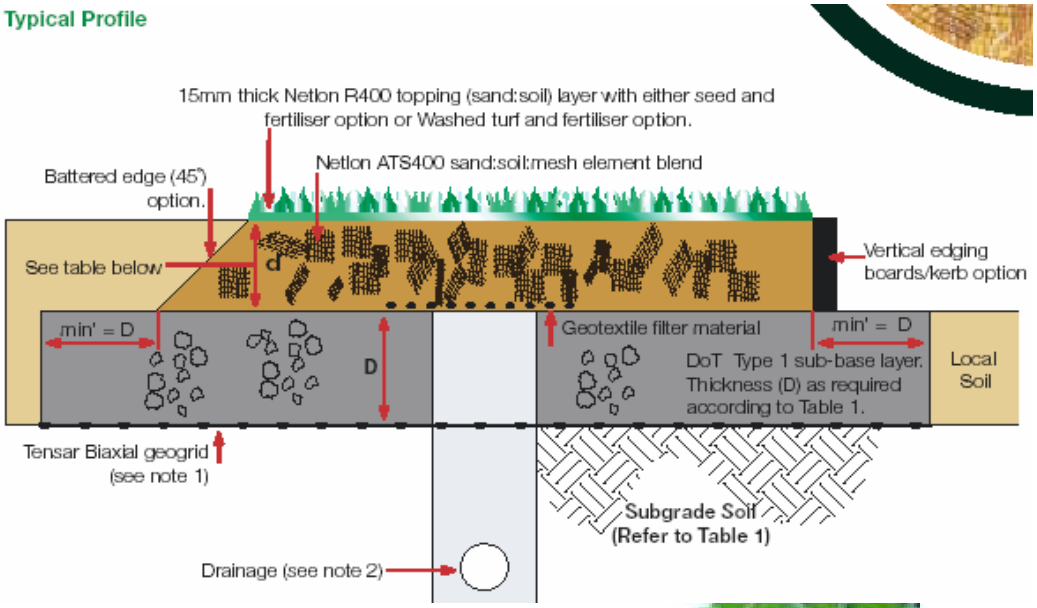
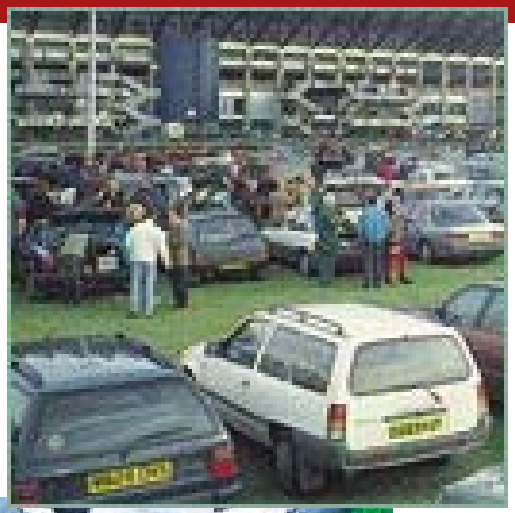
Water Resources Management

Typical Profile





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Water Resources Management

Funding Mechanisms

Urban Runoff Ordinance, in lieu fees

Stormwater Utility fees

Grants: County: Proposition A, MTA
State: Proposition 12, Proposition 13 (multiple phases), Proposition 40, CA Integrated Waste Management , PIE
Federal: ISTEA, Possible 319(h), Possible Call for Projects, EPA Water Initiative
MWD: ISA
Colorado one, possible

SMURRF

Santa Monica Urban Runoff Recycling Facility

Joint Santa Monica-Los Angeles Project

- Reuse a local water resource.
- Keep a pollution source out of Santa Monica Bay.
- Reduce imported water supplies & impacts on other watersheds.
- Open, walk-through facility to educate the public.
- Up to 500,000 gallons/day, ave. is 325,000
- 3% of City's daily water use.
- $12 Million
- $175,000 O&M

City of Santa Monica

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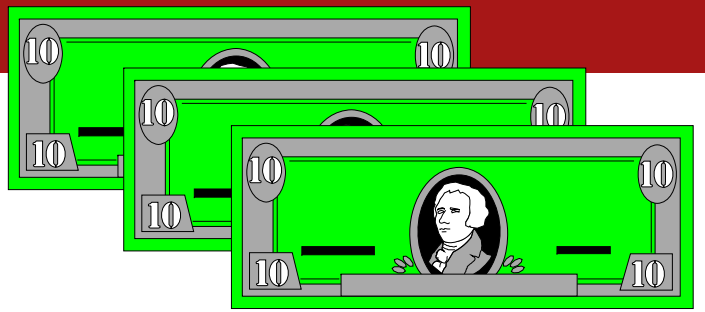
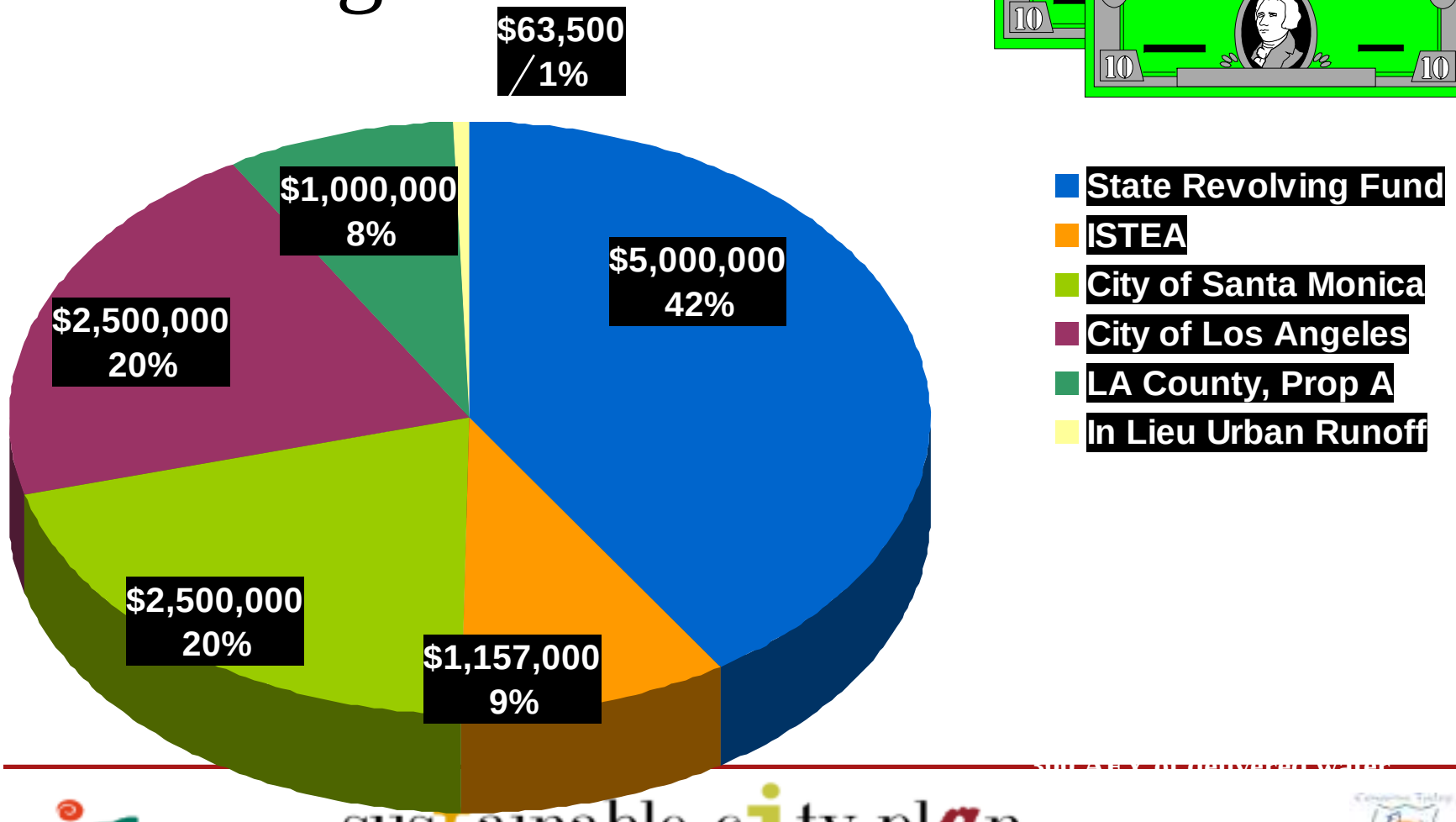
Water Resources Management

Funding Sources





Recommended Treatment for Reuse with Recycled Water

Runoff In → **Screens Degritters** → **DAF** → **Membrane Filtration** → **Ultraviolet Disinfection** → **To Reuse**

- Trash
- Grit
- Suspended Solids

- Oil/Grease

- Turbidity

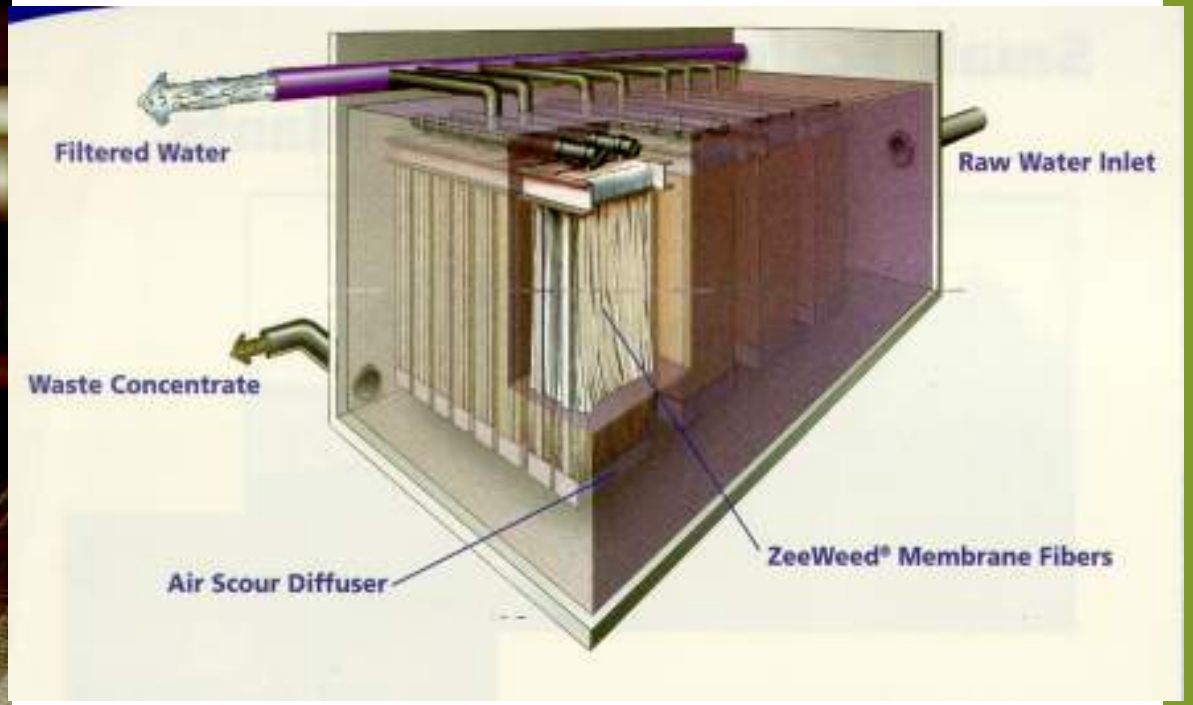
- Pathogens

Rotating Drum Screen

Grit Chamber

Dissolved Air Floatation

Microfiltration



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Water Resources Management

UV Radiation Channel

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Water Resources Management

Finished Waterfall & Reservoir

SMURRF Educational Panels

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Water Resources Management

Artwork

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Water Resources Management

Water Quality Issues Addressed

Pollutants of Concern Found in Urban Runoff

Trash, Bacteria, Heavy Metals, Organics, Nutrients, Oil/Grease

All Dry Weather Flows

80% Wet Weather Flows (3/4” storm events)

What has Not Worked, Why

StormTreat: Arid climate v. Year-round rain

Catch Basin Inserts: O&M reality check, pick the right ones

Still have many projects to install so in the next few years, the City will gain more experience with new BMP systems

What has Worked, Why

Vortex Separation-Screening: End of pipe, O&M, no moving parts & electricity, gravity-flow

Catch Basin Inserts: Select the right one for the right location, O&M program

Permeable Paving: Design and installation, O&M program

Recycling Facility: Design, O&M

Post-Construction BMPs

Managing NPS Pollution:
How the City URMP Works

Primary Strategy: Infiltration through Smart Growth, Low Impact Development strategies

Secondary Strategy: Multi-POC Treat & Release strategies

Thank You

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www.santa-monica.org/engineering

www.santa-monica.org/environment

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Water Resources Management